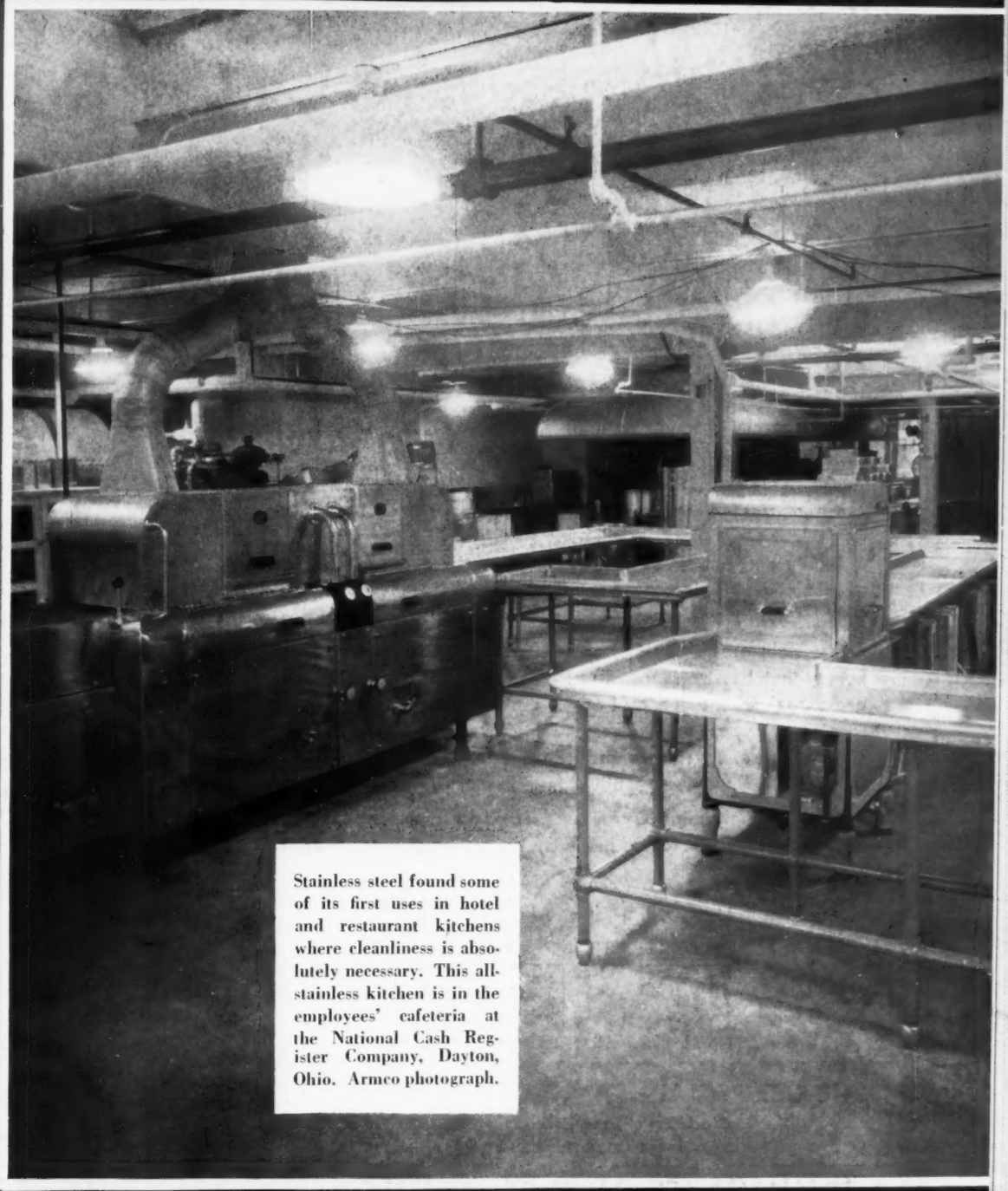
AMERICAN ARTISAN

WARM AIR HEATING • AIR CONDITIONING
SHEET METAL CONTRACTING



Stainless steel found some of its first uses in hotel and restaurant kitchens where cleanliness is absolutely necessary. This all-stainless kitchen is in the employees' cafeteria at the National Cash Register Company, Dayton, Ohio. Armco photograph.

ABLISHED
8 8 0

ARCH
1937

THE AIR CONDITIONING SECTION

Page 35

Beautiful Jackets!

STYLE AND BEAUTY ARE ACHIEVED ONLY THROUGH EXPERT CRAFTSMANSHIP

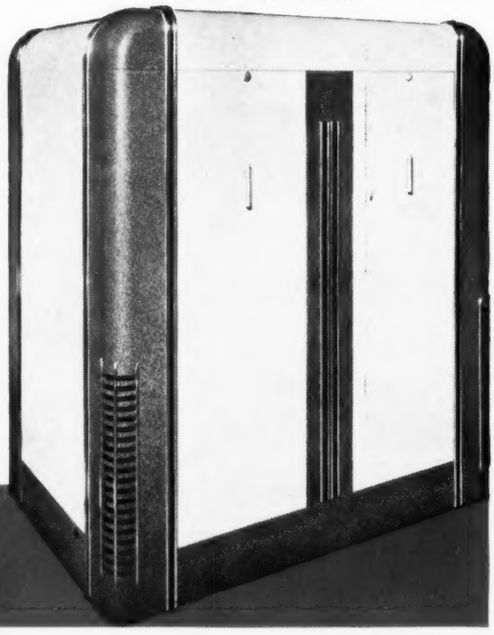
● Let Berger modernize and beautify the boilers, oil burners, stokers, and air-conditioning units you manufacture . . . *with Berloy steel jackets tailored to your product's need!*

At the right are two typical examples of the rich, "streamlined" beauty that has transformed well-known units. Berger offers in one organization a group of expert designers and metal-working specialists, supported by complete, efficient facilities, for the manufacture of sheet metal products of every description. Berger efficiency in *large-scale* production means *money saved* for you!

We can definitely help you create a greater demand for your products. Ask our artists in tailored steel craftsmanship to help you—*now!*

(Above) *Oil-burning, air-conditioning unit jacket designed for Fox Furnace Co., Elyria, Ohio*

(Below) *A Berloy jacket designed for L. J. Mueller Furnace Co., Milwaukee, Wis.*



REPUBLIC STEEL

B

BERLOY

REPUBLIC STEEL

THE BERGER MANUFACTURING COMPANY

Subsidiary of Republic Steel Corporation

CANTON, OHIO

How to figure Correct Duct Areas in 5 minutes —*without a pencil*

● THE RULE of 30

for Winter Heat Delivery only

LEADER PIPE AREAS for ENTIRE HOUSE

in square inches equals cubic foot contents of house divided by 30. Use 85% of this area for the cold air returns.

LEADER PIPE AREA FOR ANY ROOM

in square inches equals cubic foot contents of the room divided by 30—every room in the house must be figured on this same basis.

(The above computations are based on six (6) air changes per hour. Only the active space in the house to be heated is counted. If the attic or basement are not to be heated—do not include their areas. Use the standard duct size having an area that comes closest to the area as figured above.)

● THE RULE of 20

for Winter Heat Delivery and Night Air SUMMER COOLING

Proceed as above but divide by 20 instead of 30—this provides duct capacity for nine (9) air changes per hour—select *next larger* nearest standard duct size—particularly on the first floor, so as to have ample area for ten (10) changes per hour for effective summer cooling.

COLD AIR RETURN AREAS Use same areas as figured above for winter heating only—excepting that the part of the cold air return used in the Night Air Cooling circuit (from night air entrance panel to the furnace) should be figured by the Rule of 20.

INSTALL BLOWERS ON EVERY JOB

No one would think of installing a furnace without a blower if they knew the facts. They insure comfortable heat delivery to every room in the house and actually pay for themselves in fuel saving. Stop taking chances! Every gravity job is a gamble—let the "Professors" try to figure them out! Play safe by installing a Hold-Heet Planoidal Blower Unit!

Make every installation by the Rule of 20 so as to provide ample duct areas for summer cooling. Such an installation costs a little more than a forced air job figured by the Rule of 30. Explain to your customers that the little extra cost for the larger duct areas is all they are paying for an effective summer cooling system. Bear down on these features. When your prospects realize that none of your competitors are offering these features, you will surely get the business.

How to Select the Hold-Heat Blower for the Job

Active Space in House	*For Night Air Cooling and Winter Heating*	*For Winter Heating Only— With Small Ducts*
5,000-12,000 cu. ft.	1—B1F Unit	1—B1F Unit
12,000-19,000 cu. ft.	1—B3F or 2—B1F	1—B1F Unit
18,000-27,000 cu. ft.	1—B5F or 3—B1F	1—B3F Unit

For winter heating only with air duct areas approximating gravity practice (Rule of 20). A single B1F Unit has ample capacity for any house that can be heated with a furnace having a fire pot of 28" in diameter or less.

Only Hold-Heet Offers:

OVERSIZE FILTER INSTALLATION INSURES FREE GRAVITY CIRCULATION—Four 20" x 30" Hold-Heet viscous coated filters No. F3—2400 square inches—more than double the area commonly employed—double area means double life—at least two years on most jobs—low resistance, only .02" at 2000 c.f.m. compares with .08" to .10" on most competitors—much heat is delivered by gravity—reduce operating cost when required.

100-SPEED CONTROL—No belts or pulleys to change. Simply turn the control handle to obtain air delivery required—moderate in mild weather—more in cold weather—then full speed ahead for night air cooling in summer. Capacity instantly adaptable from small house requirements up to and including 28" fire pot jobs (doing a perfect job in a large parsonage with 34" fire pot furnace in Sioux Falls).

"JET AND TARGET" HUMIDIFIER—Insures adequate humidity—supplied complete with controls. Every B1F cabinet has mounting holes for this equipment. These units may be purchased either with or without the automatic humidity equipment.

UNDIVIDED RESPONSIBILITY—Every part of this unit—motor, blower, filters, controls, cabinet—is built complete in the Hold-Heet factory. Every part is co-ordinated to the utmost in performance.—No "buck-passing" here if anything goes wrong.

ANY FURNACE MAN CAN SELL and INSTALL this unit, for it comes completely assembled, ready to connect up to the cold air return line.

28" x 30" x 51" CABINET OF 18 GAUGE STEEL—Completely coated inside with sound-deadening material (no hidden costs—compare this with the flimsy, light cabinets commonly employed and shipped knocked down). Completely assembled at the factory—no hood to build—no cementing in of base—simply level up—no canvas connections required. Metallic aluminum lacquer finish harmonizes with any furnace trim.

NOISELESS 23" PLANOIDAL BLOWER of 48% static pressure efficiency in desirable range. 1500 c.f.m. on small duct jobs—2100 c.f.m. on low resistance jobs and for summer cooling with night air.

DIRECT-CONNECTED, VERTICALLY-OPERATING, ⅛ H.P. BALLENTINE CAPACITOR MOTOR—No starting switches—no brushes—no radio interference—does not dim lights when starting—can stall for long periods without injury—5,000 hour lubrication—one place to oil—at least three times the motor value found in other units.

UNLIMITED GUARANTEE ON EVERY PART—Of the thousands and thousands of these units that Hold-Heet have sold since they were first introduced in 1932, we have never charged 1c for repairs or replacement on defective or unsatisfactory parts. This is the way Hold-Heet always makes good under a one-year standard service warranty. The unit has become so highly perfected that service has shrunk to an absolutely negligible item. You and your customers are not taking chances when you buy Hold-Heet.

SEND NOW **for full information with free Manual No. 936 on Sales, Service, and Installation! It is full of invaluable information for you.**

RUSSELL ELECTRIC CO., *Mfrs.*
342 West Huron Street, CHICAGO, U. S. A.

In This Issue

A serious situation has arisen in New York state. An examining board is to be set up to say who shall design and install air conditioning. So far so good. But the board is to be four-fifths steam fitters with one mechanical engineer. Our industry is not represented. Your objections will assist the New York associations. See page 22.

*

Despite all the information available on Social Security it is plain that specific questions are yet troubling readers. One reader, on page 30, asks Joseph G. Dingle some very interesting questions. Perhaps you have some problems of a similar nature. Mr. Dingle's answer will be useful if you use casual labor.

*

With dehumidification coming rapidly to the front as an aid in industrial processing, the problem of the soap dye plant on page 28 should be of interest. Wherever moisture is condensed this condition may arise.

*

For many months the technical code committee of the NWAH & AC Assn. has been hard at work developing a new code to fit present-day requirements. This code is now printed and ready for distribution. It is very complete; will fit almost any type of structure or degree of winter air conditioning. We will publish this code and use typical jobs to show how it should be used. The first part of the code appears on page 57.

*

Those air conditioning contractors not having years of experience in sheet metal fabrication will find the series on developing the patterns for air conditioning fittings of special value. The second article in the series appears on page 62.

*

Sometimes a contractor or engineer will actually admit that one of his installations did not work according to specifications. When he so confesses and tells why and how he remedied the job—there's a story. B. L. Schwartz of Pittsburgh, who has been identified with air conditioning so long that he knows we all make mistakes, takes us behind the scenes on one trouble job and tells why and what he did about it.

*

And S. Konzo carries forward his short series on different methods of designing duct systems with a discussion of two variations of the "equal friction per foot of duct" method so simply explained that readers will surely want to try it out on the next job. See page 69.

AMERICAN ARTISAN

With which is merged

FURNACES and SHEET METALS AND Warm-Air Heating

Covering All Activities in

Gravity Warm Air Heating — Forced Warm Air Heating
Sheet Metal Contracting — Ventilating
Air Conditioning

J. D. Wilder, Editor

A. A. Kennedy, Assistant Editor — Brewster S. Beach, Consulting Editor

Vol. 106, No. 3 — March, 1937 — Founded 1880

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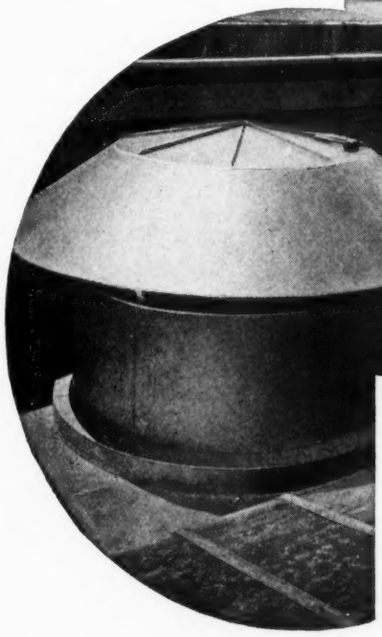
More than 8,000 Copies of this Issue are being distributed

PROFITS...

from Roofs that are Out-and-Out Tough!

THE ROOF PROPER

Installing Monel standing seam roof on Metropolitan Museum of Art, New York, N. Y. Monel nails with Monel clips are used for their strength and rust proofness. Contractor, J. J. Fisher Co., Inc., Brooklyn, N. Y.



VENTILATOR EXHAUST

Monel ventilator exhaust on roof of Museum of Arts & Science, Brooklyn, N. Y. Monel was used extensively on the roof proper, as well as for flashings, gutters, and skylight trim on the recent restoration of this roof.

ROOF, GUTTERS, AND LEADERS

Monel-trimmed pyramid roof on an Anchor Oil Co. gasoline station at Milwaukee, Wis.

WHEN it comes to roofs, the owner of a gas station isn't so different from the owners of a public building. Both buy from you, and both want the same thing:

Durability. Lastability. Call it by any name you please, so long as it means protection for the building with little or no expense for repairs.

The jobs shown on this page were done by men just like yourself. They sold Monel* for these jobs. By showing the owners the reasons why Monel saves them money:

Stronger than steel, a Monel roof is safe. Since Monel never rusts, and resists corrosion from the fumes and grime of cities, Monel *holds* that strength.

Another BIG advantage: Changes from heat to cold have less effect on Monel than on other roofing metals, because Monel expands and contracts less.

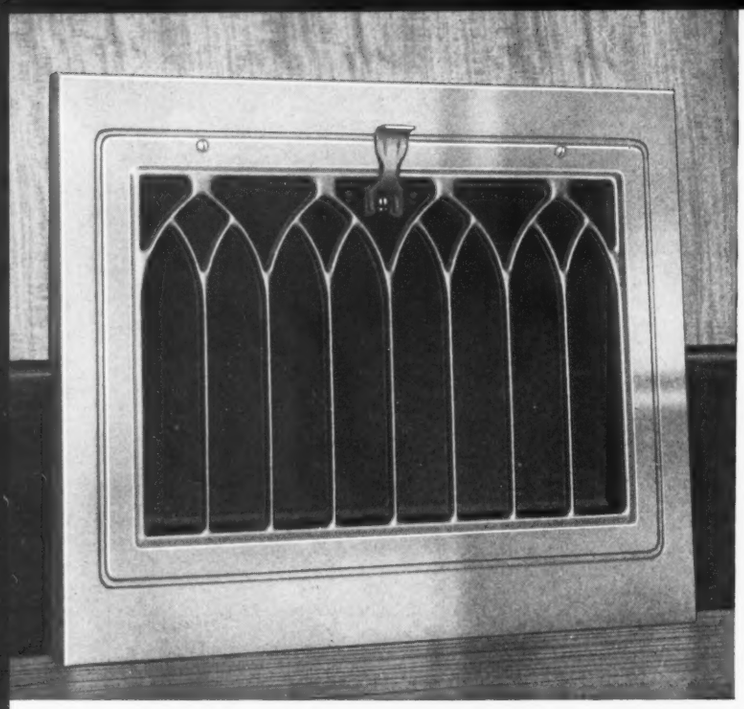
That Monel is readily fabricated you already know. And once you shape it for roofing and roof trim, your customer's building has protection—and your customer is through with worry about upkeep costs—for a long, long time.

Let us quote you prices on Monel sheet. And send you service records of Monel roofs. Your first step towards landing some of this profitable business is to write to-day for your FREE copy of the folder, "*Monel for Permanent Roofs.*" Address:

*Monel is a registered trade-mark applied to an alloy containing approximately two-thirds Nickel and one-third copper. This alloy is mined, smelted, refined, rolled and marketed solely by International Nickel.

MONEL

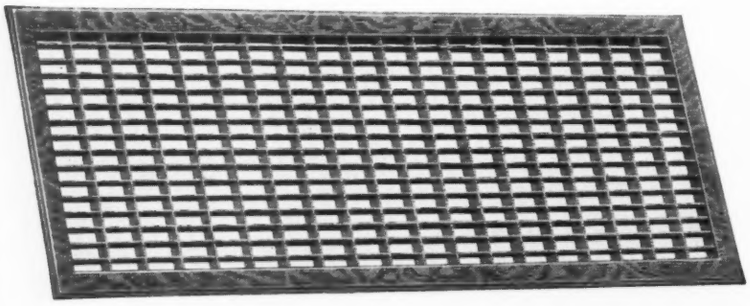
THE INTERNATIONAL NICKEL COMPANY, INC.
67 WALL STREET NEW YORK, N. Y.



H&C LEADERS IN THE HIT PARADE

OF the gravity registers at present bidding for popular favor, these three newer members of the H & C Line have definitely established themselves as Leaders in the Hit Parade. The way installers everywhere are turning to these items demonstrates that they have "it" in abundance—the appeal of attractive appearance, careful skilled workmanship, fine finish and all the qualities that make for neat, secure, satisfaction-giving installations. If you believe, as nearly all alert installers do, that it pays to handle the best registers available, by all means inspect these registers and the rest of the great H & C Line at your H & C Jobbers.

If you haven't as yet received your copy of the new H & C General Catalog No. 37, or Air Conditioning Catalog No. 37AC, ask your Jobber for one or write direct.



UPPER LEFT: H & C No. 120 Baseboard Register combines the most popular face design ever incorporated in a baseboard register, with a construction that permits the stackhead to be lapped over the register frame—insuring a very neat, tight installation.

CENTER: H & C No. 210 "NO-FLEX" Floor Register. Exceptionally rigid, with mesh openings 7/16" x 1 7/16". Because there is no premium price for this heel-proof sturdy register, it is recognized as the outstanding value in floor registers.

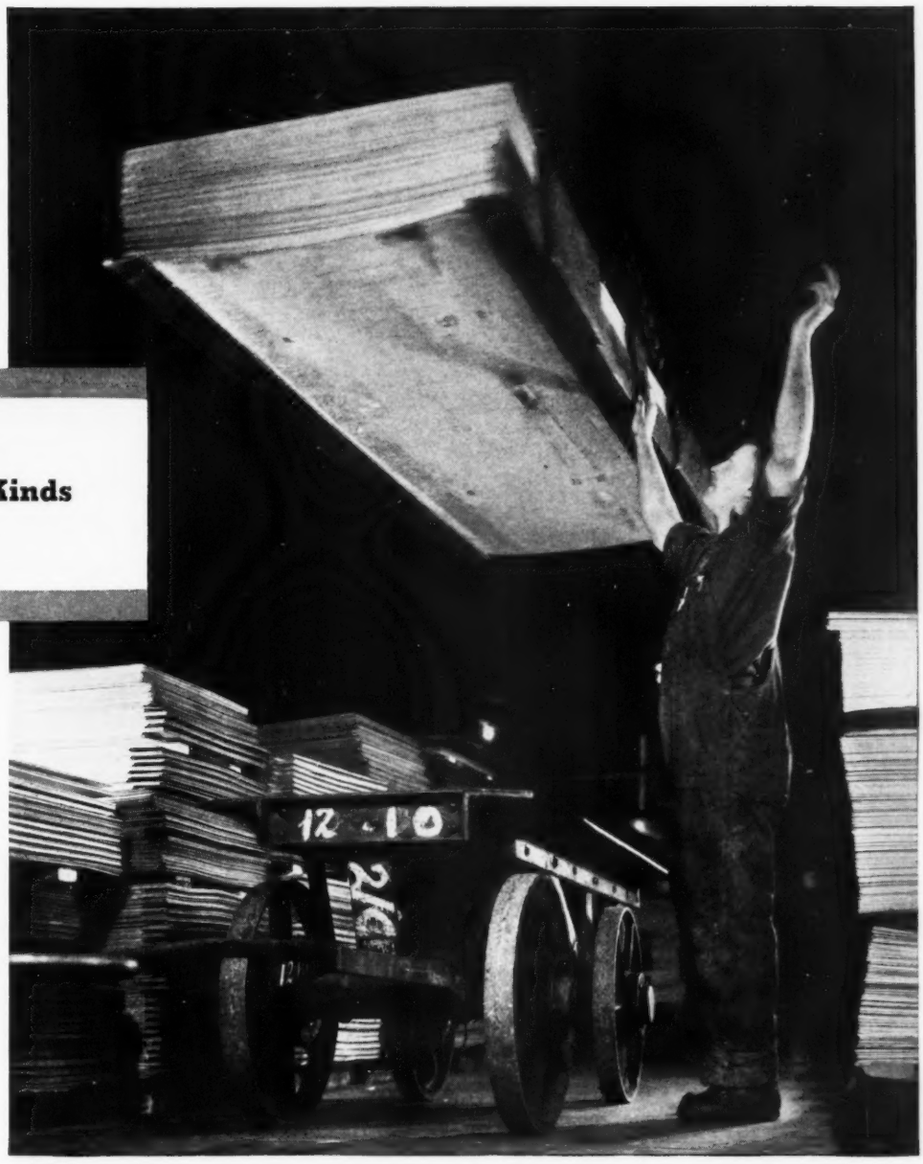
LOWER LEFT: H & C No. 265 "NO-FLEX" Return Air Face. Combines many superior features of construction. Cross members are welded to each other and to the frame for maximum strength. Upper edges of members are squared for better walking surface. Corner joints are invisible. Margins are narrow for close installation.

HART & COOLEY MANUFACTURING CO.

Warm Air Registers
Damper Regulator Sets
H&C
Air Conditioning Grilles
Dampers, Chain, Pulleys

61 W. KINZIE STREET, CHICAGO, ILLINOIS

ENGINEERING OFFICE AND FACTORY · HOLLAND · MICH·



Sheets . .
More than 25 Kinds
in Stock

The Right Sheet for Every Purpose

● More than 25 different kinds of sheets are carried in Ryerson stocks. This wide range makes it easy to select the sheet best suited to each particular job—And you can get it immediately in any quantity. In addition, one order can cover all your requirements for other steel products such as angles, channels, rivets, bolts, welding rod, etc. Combine your orders and save office work, time, trouble, and money. If you do not have the current Ryerson Stock List, write, we will be glad to send it.

Joseph T. Ryerson & Son, Inc., Chicago, Milwaukee, St. Louis, Cincinnati, Cleveland, Detroit, Buffalo, Philadelphia, Boston, Jersey City.

PARTIAL LIST OF SHEETS CARRIED IN STOCK

Abrasion Resisting Stainless Steel	High Carbon Hot Rolled Annealed
Ingot Iron	Locomotive Jacket
Blue Annealed	Long Terne
Bullet Proof	Perforated
Copper Alloy	Radio Transformer
Corrugated	Stretcher Levelled
Deep Drawing	Tool Steel
Electrical	Uniform Blue
Enameling	Vitreous Enameling
Galvanized	Wellsville Polished
Galvannealed	
Heavy Hot Rolled	
Panel & Sign	

RYERSON STEEL-SERVICE

New Prospects for

They're being developed by Anaconda Advertising. Are you in position to cash in?

INSTALLATIONS in scores of communities show the popularity of Anaconda *Economy* Copper Roofing. Anaconda advertising is developing new prospects right along. Are you in position to benefit from the business this advertising produces? This high grade, moderately priced copper roofing offers sheet metal men a splendid opportunity to get profitable residential roofing business.

No other material offers so many distinctive features. The chief advantages are: good appearance, durability, fire and lightning safety, light weight, protection for insulation against moisture-infiltration.

Anaconda distributors stock Anaconda *Economy* Copper Roofing for immediate delivery. It is packed flat in crates containing sufficient copper (48 sheets) for 3 squares of roof area. The strips are 16 inches wide and 6 feet long. Weight of copper is 10 oz. per square foot, subject to standard manufacturing tolerance. 37227

Anaconda Economy Copper Roofing

ANACONDA from mine to consumer

THE AMERICAN BRASS COMPANY, General Offices: Waterbury, Conn.
Offices and Agencies in Principal Cities • In Canada: ANACONDA AMERICAN BRASS LTD., New Toronto, Ont.

Copper Roofing Contracts

A Copper Roof that combines all this metal's advantages . . . yet is moderate in cost
Residence designed by Dwight James Baum, Architect, showing use of Anaconda Copper Roofing
Anaconda Copper Roofing is fire-safe, durable and economical through the years
From "copper headquarters" . . . has come another contribution to your comfort and security. A roof that "belongs" to the fine home, that will reflect lasting credit upon your judgement in selecting it. A roof that, properly grounded, protects against lightning! A roof—fire-safe, that earns a low insurance rate: A roof that is tight, eliminating moisture and air-infiltration!
This new Anaconda Roofing for the home is lighter in weight (10 ounces per square foot), and in narrower sheets. It is rigid . . . good looking . . . yet costs much less than you would expect! Let us tell you more about it.
Anaconda Copper Roofing Offers:
Charm and Dignity—Weathered copper harmonizes with landscaping at all seasons.
Fire-Safe—Copper roofing eliminates the spark hazard.
Lightning Proof—When properly grounded, protects the structure against lightning.
Light Weight—Copper needs no heavy, costly supporting structures.
Protects Insulation—Impervious to moisture, copper preserves the efficiency of under-roof cellular insulation.
ANACONDA
Anaconda Copper
THE AMERICAN BRASS COMPANY . . General Offices: Waterbury, Connecticut
Offices and Agencies in Principal Cities . . In Canada, ANACONDA AMERICAN BRASS LTD., New Toronto, Ont.
• Write for more information about this new residential copper roofing

One of a series of advertisements appearing in "House & Garden", "House Beautiful", and "Town & Country" telling the thousands of prospective home builders the country over all about Anaconda *Economy* Copper Roofing.

Right now . . .
you can settle for good
THE QUESTION OF DAMPER CONTROLS

Parker-Kalon gives you TWO manual damper controls that cover all jobs . . . unbeatable for quality and efficiency . . . SAFE TO STANDARDIZE ON

COMPARE these two superior manual controls for dampers made by Parker-Kalon with any others. You will see that there's no reason for going through the process of selecting controls every time you need them. *These are controls you can standardize on.* They cover every job . . . satisfy every cost consideration. And, if you were to hunt the world over you couldn't find anything to beat them for quality and efficiency.

FOR THE JOB THAT REQUIRES "THE BEST" . . . install the famous *Unxld Damper Quadrant.* For years it has been preferred for reliability and efficiency by engineers, architects, contractors.

WHERE EFFICIENCY AT LOW COST IS SOUGHT . . . use the *Improved Parker-Kalon Dial Damper Regulator.* With its new, one-piece air-sealing construction and other advantages, this device provides a high degree of efficiency. Yet it is inexpensive enough to satisfy anybody who wants a good job.

Both of these fine Parker-Kalon Controls come in handy complete set units. In one box you get everything needed for an installation—the control device, with superior new Universal Bearings, Sheet Metal Screws and rivets. Write us or ask your supply house for folder giving complete information.

PARKER-KALON CORPORATION, 190 Varick St., New York

Products of

PARKER-KALON CORPORATION

SOLD ONLY THROUGH RECOGNIZED DISTRIBUTORS

Because they FORM EASILY ...LAST LONGER

Specify U·S·S

WHEN you buy galvanized sheets, are not these two questions uppermost: Do they form easily? Will they last? If you ask for USS Copper Steel Galvanized Sheets, the answer to both questions is "YES."

USS Copper Steel Galvanized Sheets are ductile — you can bend and roll them without risk of fluting or flaking. These sheets are uniform, too, in quality, gauge and physical properties. Also, no matter how difficult your forming operations may be, there is a type of USS Copper Steel Galvanized which is ideal for your purpose.

In these sheets a small amount of copper has been included to supply extra corrosion resistance. Extensive atmospheric exposure tests have shown that USS Copper Steel Sheets last more than twice as long as ordinary steel sheets. And they are readily worked and joined.

When you need galvanized sheets, buy those bearing the USS trademark; you are assured of superior forming qualities and high corrosion resistance. An added advantage is that we offer you technical service and laboratory facilities which are unexcelled. Ask for help in selecting the right type of steel sheet for your forming operations.

U·S·S COPPER STEEL GALVANIZED SHEETS

CARNEGIE-ILLINOIS STEEL CORPORATION · *Pittsburgh and Chicago*
COLUMBIA STEEL COMPANY · *San Francisco*
TENNESSEE COAL, IRON & RAILROAD COMPANY · *Birmingham*

Columbia Steel Company, San Francisco, *Pacific Coast Distributors* : United States Steel Products Company, New York, *Export Distributors*

UNITED STATES STEEL

Our New Handy Pipe and Duct Work Catalogue will be ready about April 1st.

No Foolin'! It will help you do better work and make more money in 1937.

If you want a copy, send a request on coupon, post-card or letter-head to

F. Meyer & Bro. Co.
1311 S. Adams St.
Peoria Ill.
The Handy Pipe People.

Please send us your new catalogue No. 50.

3 TONS OF REVERE SHEET COPPER *for Worcester City Hospital Addition*

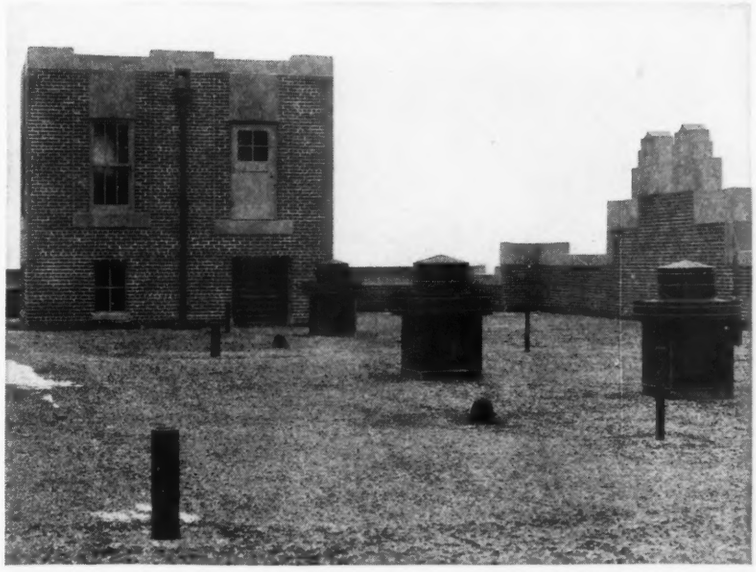
• More than 6,000 pounds of Revere sheet copper were used for flashing, ventilators, etc., in construction of the new Ward and Surgical Building of the Worcester City Hospital, Worcester, Mass.

Liberal use of copper is of course typical of fine institutional buildings. Of even greater potential importance, however, is the increasing demand for sheet copper and lead-coated sheet copper for low-cost buildings, such as small houses. This demand comes from the general public which is insisting on getting permanent building materials, and is supported in this attitude by the national home-making magazines.

The situation offers sheet metal contractors an opportunity to increase their share of the over-all building outlay.

When you recommend and use Revere Sheet Copper and Revere Leadtex (lead-coated sheet copper), you are putting yourself in line to profit by this trend.

Ask your distributor for these and other Revere products such as Cheney Flashing (the flashing that bonds firmly in all directions) and Revere Thru-Wall Flashing.



• Roof views of the new Ward and Surgical Building of the Worcester, Mass., City Hospital, where Revere Sheet Copper was used. The Sheet Metal Contractor was the American Roofing Co., Worcester, Mass.; the General Contractor was the George A. Fuller Company, Boston, Mass.; and the Architects were Stevens, Curtin & Mason, Boston, Mass. The Revere sheet copper used was purchased from Merrill and Usher Company, Worcester, Mass.

Revere Copper *and* Brass

INCORPORATED

FOUNDED BY PAUL REVERE 1801

EXECUTIVE OFFICES: 230 PARK AVENUE, NEW YORK CITY · MILLS: BALTIMORE, MD. · TAUNTON, MASS. NEW BEDFORD, MASS. · ROME, N. Y. · DETROIT, MICH. · CHICAGO, ILL. · SALES OFFICES IN PRINCIPAL CITIES

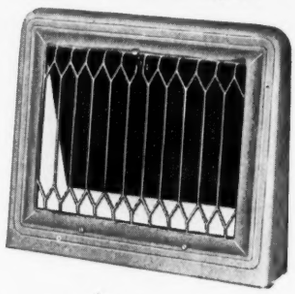
DOUBLED FACTORY PRODUCTION

US Carries on for 1937 Develops Output and Maintains Their Old SUPERIOR QUALITIES in the FINEST in AIR CONDITIONING and GRAVITY HEATING REGISTERS

National Baseboard Register

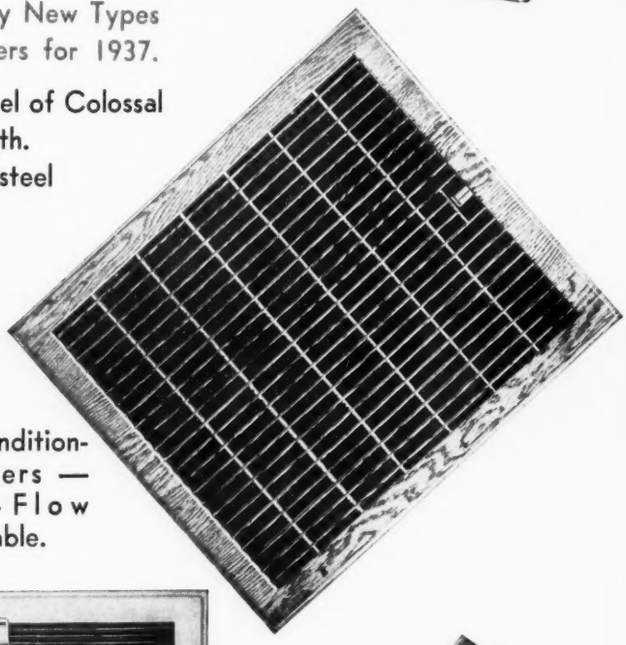
The TWO MAJOR LINES in Vogue with the BEST in MODERN HEATING SYSTEMS. A Uniform Design available throughout the job for every required purpose.

Panama Baseboard Register

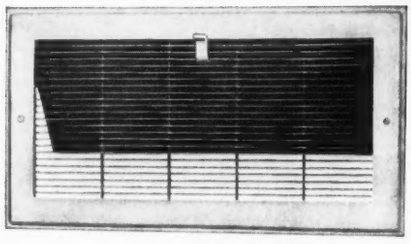


Two Distinctively New Types of Floor Registers for 1937.

U S Embossed Steel of Colossal Strength.
U S Trussteel



U S Air-Conditioning Registers — Directional - Flow and Adjustable.



New U S Special STEEL Faces develops more definite Power and strength than any type of Cold Air made.

Also with Damper-Stop. Write for Latest Catalog for Complete Details of these New Developments.

U S TRUSSTEEL Made in Open and Close Space. Perfectly made and Finished. No Flaw, Corner Cracks or Bad Spots.

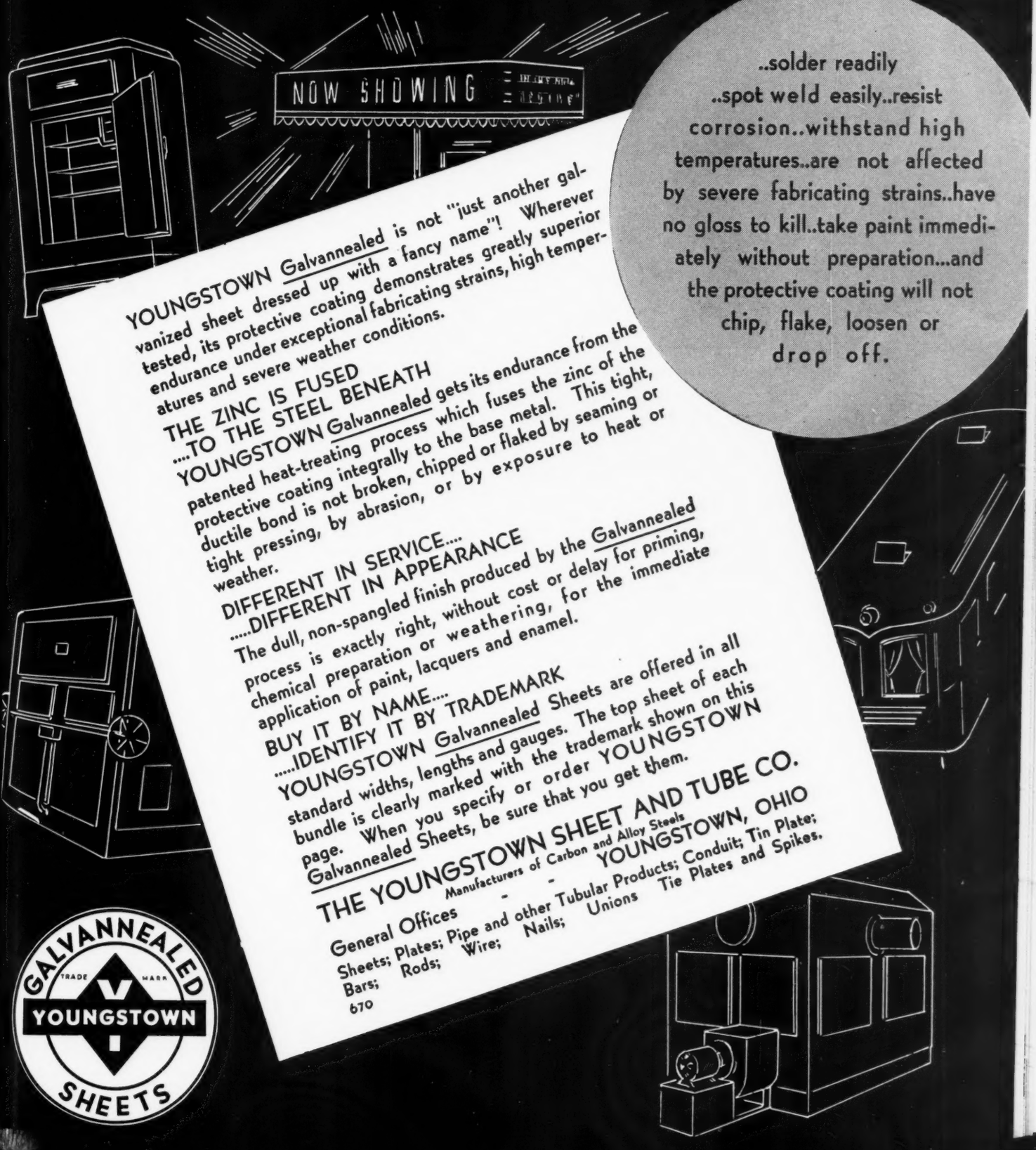
Write for complete Catalog No. 27 and Pocket Manual 27

UNITED STATES REGISTER COMPANY, BATTLE CREEK, MICHIGAN

Minneapolis, Minn. Kansas City, Mo. Albany, N. Y. New York City San Francisco, Calif.

YOUNGSTOWN

YOUNGSTOWN GALVANNEALED SHEETS LAST LONGER



YOUNGSTOWN Galvannealed is not "just another galvanized sheet dressed up with a fancy name"! Wherever tested, its protective coating demonstrates greatly superior endurance under exceptional fabricating strains, high temperatures and severe weather conditions.

THE ZINC IS FUSED
....TO THE STEEL BENEATH

YOUNGSTOWN Galvannealed gets its endurance from the patented heat-treating process which fuses the zinc of the protective coating integrally to the base metal. This tight, ductile bond is not broken, chipped or flaked by seaming or tight pressing, by abrasion, or by exposure to heat or weather.

DIFFERENT IN SERVICE....
.....DIFFERENT IN APPEARANCE

The dull, non-spangled finish produced by the Galvannealed process is exactly right, without cost or delay for priming, chemical preparation or weathering, for the immediate application of paint, lacquers and enamel.

BUY IT BY NAME....
.....IDENTIFY IT BY TRADEMARK

YOUNGSTOWN Galvannealed Sheets are offered in all standard widths, lengths and gauges. The top sheet of each bundle is clearly marked with the trademark shown on this page. When you specify or order YOUNGSTOWN Galvannealed Sheets, be sure that you get them.

..solder readily ..spot weld easily..resist corrosion..withstand high temperatures..are not affected by severe fabricating strains..have no gloss to kill..take paint immediately without preparation...and the protective coating will not chip, flake, loosen or drop off.

THE YOUNGSTOWN SHEET AND TUBE CO.
Manufacturers of Carbon and Alloy Steels

General Offices - - YOUNGSTOWN, OHIO

Sheets; Plates; Pipe and other Tubular Products; Conduit; Tin Plate; Bars; Rods; Wire; Nails; Unions Tie Plates and Spikes.

670

GALVANNEALED TRADE MARK YOUNGSTOWN SHEETS

H. P. Mueller, President, watches No. 2 cupola of the 650-foot Mueller foundry in action.

MAYBE WE ARE OLD FASHIONED

ONE day, when I was at that know-it-all stage in my teens, I called my father "old-fashioned," (under my breath of course). To me he was old-fashioned, at that time, because his seasoned ideas didn't approve of my juvenile notions.

Well, I've been called old-fashioned many a time since then. There's another generation coming along, and I don't agree with some of its ideas. Styles may change, but the old-fashioned virtues—the sound fundamentals—are still secretly admired by the best of men, young and old alike. Nobody can criticize the golden rule just because it came into high vogue many years ago.

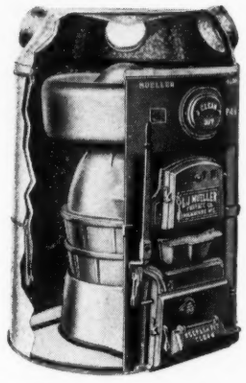
Yes, maybe we're old-fashioned here at the Mueller Furnace Company. Somehow, I hope we are. For I believe it's possible to be old-fashioned and modern too. I believe we can cling to the old-fashioned ideals of truth, honesty and tolerance upon which this business was founded by my granddad, and still be as modern as tomorrow's sun by designing and building heating equipment that the people of today want and buy.

The industry has been gracious enough to admit that our 1937 heating and air-conditioning equipment is the biggest value on the market today. Its smart styling has created endless comment; and its performance, we are told, outdoes modern standards. But back of it all, today as yesterday, the old-fashioned virtues prevail.

Get all the facts about our 1937 line. Write today for Catalog AA-3.

H. P. Mueller

L. J. MUELLER FURNACE COMPANY, Milwaukee, Wisconsin. *Manufacturers of Coal, Oil, Gas Furnaces and Boilers, for homes, schools, churches. Complete air conditioning equipment. Registers and fittings.*



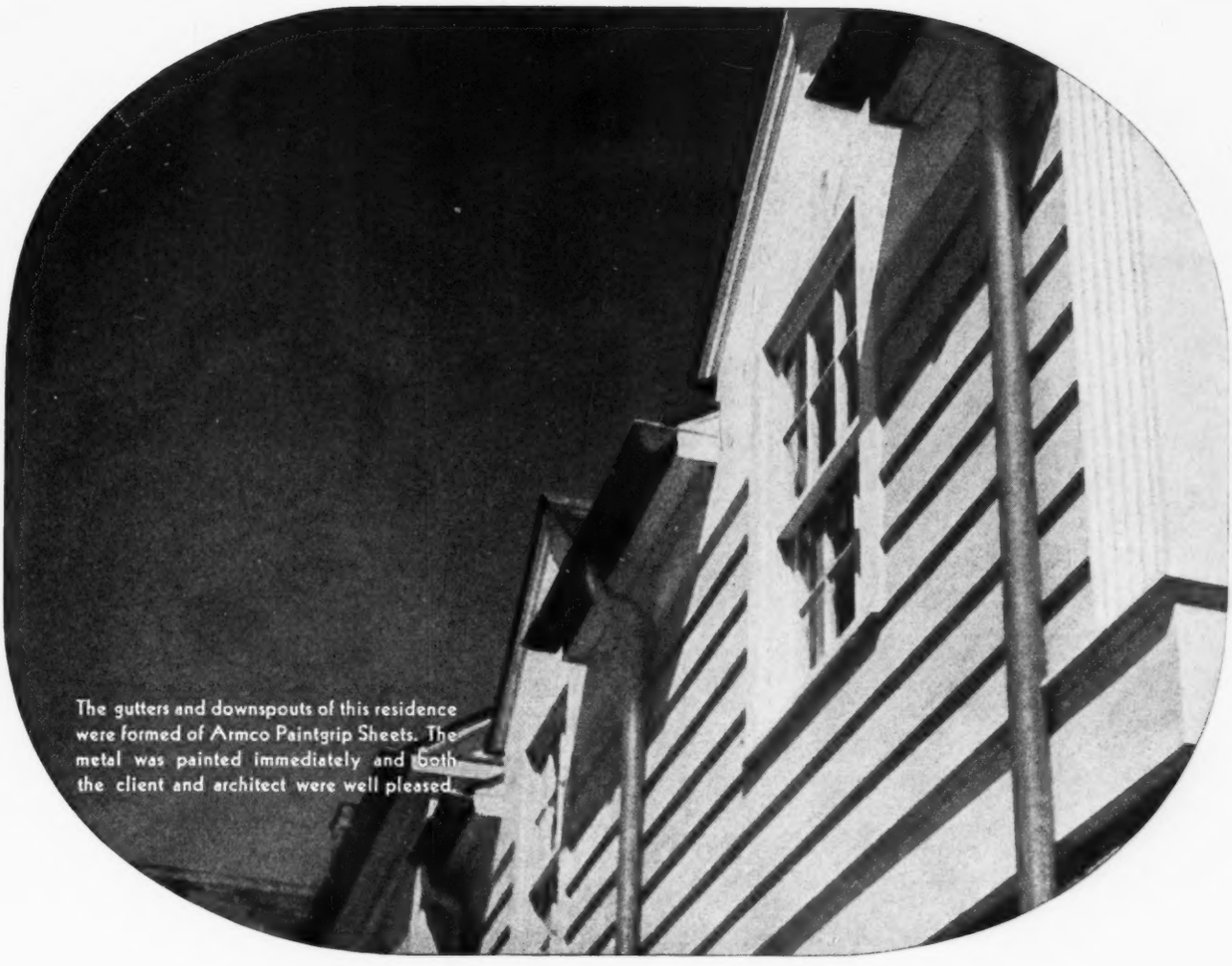
MUELLER FULL FRONT FURNACE

The "Full Front" Furnace has achieved a position of leadership in warm air heating of homes throughout the country. Radiators are one-piece, streamline construction with integral smoke and cleanout openings extending through the casing and shield. Feed and ashpit sections extend through fronts, with slip-over shield, simplifying erection and eliminating bolted construction.

MUELLER-MILWAUKEE

YOU CAN SELL MORE JOBS

WITH ARMCO PAINTGRIP



The gutters and downspouts of this residence were formed of Armco Paintgrip Sheets. The metal was painted immediately and both the client and architect were well pleased.

Armco Galvanized Paintgrip Sheets offer many advantages to sheet metal contractors and their customers. They have forever solved the old problem: How to make paint stick to a galvanized surface without acid-etching or weathering.

You sell these sheets on their own merit at a full margin of profit. Customers accept them readily for the protection of a *full-weight* galvanized coating and the immediate beauty of paint.

Something else that appeals to people is that under the paint-holding galvanized coating they may have durable Armco Ingot Iron; thus adding years of trouble-free service to the installation. Armco Paintgrip also prolongs paint life. The special insulating surface helps keep paint elastic.

Think what this means to you in terms of sales and profits! Armco Galvanized Paintgrip sheets are available in sheets, formed roofing, gutters and downspouts. The Armco Distributor can quickly supply you with the right grade, gage and size for the job in Armco Ingot Iron or plain and copper bearing steel. When you call him ask about the many valuable business-promoting services he offers. The American Rolling Mill Company, Executive Offices: Middletown, Ohio. District offices in all key cities.

ARMCO

ARMCO GALVANIZED PAINTGRIP SHEETS

GET IN THE SWIM

with

REPUBLIC STEEL

ENDURO

REG. U. S. PAT. OFF.

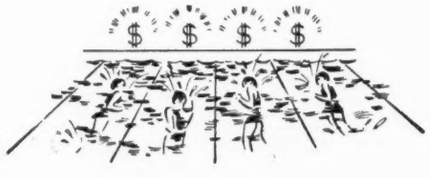
REPUBLIC'S PERFECTED STAINLESS AND HEAT-RESISTING STEELS

Licensed under Chemical Foundation Patent No. 1339378.

● Opportunity is knocking at your door—in the form of jobs involving the use of stainless steel. Are you obtaining your share of this profitable business?

You can get in the swim that leads to more dollars in your bank account with ENDURO, Republic's Perfected Stainless and Heat-Resisting Steels, if you have modern shop equipment.

ENDURO is a beautiful metal, it resists corrosion, lasts indefinitely and fabricates without trouble to every desired shape. Its popularity is growing rapidly through advertising placed in architectural and industrial publications and in Sweet's Catalog by Republic to help you obtain more jobs in which stainless steel is used—and your reputation and business will grow, too, when you use it. Write for complete detailed information.



● *The fluted columns or architraves, louvered window frames, lintels, mullions, louvers in air vent shafts and clothes chutes of the Astoria Park Swimming Pool, Borough of Queens, New York City, shown above, were fabricated of ENDURO Stainless Steel by Somaron Sheet Metal Works without extra equipment.*

Republic Steel *Corporation*

GENERAL OFFICES . . . CLEVELAND, OHIO

ALLOY STEEL DIVISION . MASSILLON, OHIO

When writing Republic Steel Corporation for further information please address Department AA

AMERICAN ARTISAN

Volume 106 Number 3

Why Associations?

IT has become smart conversation among some individuals in recent years to pose the question—"What good are associations?"

Sometimes it has been difficult to supply an answer so incontrovertible that long winded arguments do not follow. Most persons are sensible enough to want to present a set of facts which prove a point and have no stomach for the windy generalties which lead nowhere.

Some facts bearing on this question "Why associations" have recently come to our attention. These facts are substantial selling arguments for those who believe that in unity there is strength.

Take Michigan as an example. At the state convention last week an authority declared that under the Michigan Sales Tax law many contractors are now entitled to refunds of tax moneys they paid without having had to do so. The facts behind this pleasant situation were unearthed by the state association. As a result of that effort some contractors will recover several hundreds of dollars, dozens of contractors will recover substantial sums and hundreds of contractors may recover from a few dollars to enough money to finance next Christmas.

That one effort by the state association should be worth the cost of membership.

In Fort Wayne, Indiana, an association has been functioning for several years. It has had its ups and downs, of course, but generally speaking it has continued to exist and render active service for a long time. This association has been responsible for the code which has reduced sharp practices and raised legitimate business to a profitable basis. Just recently a problem has arisen in which the heating men's association proposes to keep electricians from doing the wiring from switches to controls, motors, etc., and install pipes required for oil burners,. coils, etc. The Fort Wayne association believes that whatever they do may serve as a precedent in other cases and that the situation should be clarified so that there can never be any future argument. A situation of this kind cannot be advocated or fought by one individual or a few individuals—it is a case for an active, united association.

In New York state a bill has been printed setting up an examining board for air conditioning in each city. The members of this board according to law shall —"consist of five persons to be appointed by the mayor, of whom two shall be employing or master steam fitters of not less than ten years experience as a contractor in the business of heating, general power pipe fitting and air conditioning, two shall be journeymen steam fitters of like experience, and one shall be a mechanical engineer who has had at least ten years' experience supervising the design and installation of heating, general power piping and air conditioning systems."

What a blank wall for the warm air, air conditioning industry which began, developed and now controls air conditioning.

Where does our industry fit into such a picture? How can one man here; another man there; fight such a law? They cannot. Only a strong, representative, active association, behind which stands the entire industry from manufacturer to mechanic, can bring to bear the pressure needed in a case like this.

We feel no hesitancy in stating that during the next five years situations like these—possibly more serious—undoubtedly will arise. Our industry—not only the heating and air conditioning, but the sheet metal field as well—is being pressed on all sides to give a little ground here, a little there, the result of which will be that in five years we will either have survived as an industry which cannot be shaken or we will have vanished into obscurity.

We now hold the key to air conditioning for residences. The work cannot be installed without us, if we play our cards right. We hold the key to ventilation and large air conditioning because the installation skill required means a satisfactory job or no job at all. This work which we now control will not be our work if single individuals spotted here and there have to fight our battles for us.

Why associations?

Because without them we may not have any business five years from today.

Ventilating for Heat Removal in a Steel Wire Mill

By George H. Laws

A PRIME requisite in designing ventilation for an industrial plant is, of course, a knowledge of the changes to the air which result from the operation of the machinery and plant equipment. As an example of this statement, here is a brief analysis of the conditions existing in the wire department in which this installation was made.

The plant is operated in three shifts, twenty-four hours of the day.

Furnaces outlined on the drawings are fired by batteries of gas burners, inserted through openings along the sides of each furnace. Approximately five cubic feet of air are used with each cubic foot of gas burned in the combustion chambers of the furnaces. A sufficient supply of air for this purpose must be available. The high temperatures required for processing the wires, as they are drawn through the furnaces, produce a rapid radiation of heat into the working area and minute particles of steel and other foreign matter are given off from the surface of the wire which, if not removed at their source, contaminate the air, by diffusion in the rising currents of hot gases.

System Exhausts and Ventilates

Gas flames are forced out of each end of the fire chambers and from the brick flues at the intake end of each furnace. In view of these conditions an adequate exhaust and fresh air supply system of ventilation was essential for efficient operation of this department.

The high temperature of the air and gases to be removed accelerates the flow in the stacks sufficient for a gravity exhaust. This exhaust system consists of No. 18 gauge steel hoods over each end of the furnaces, with connecting ducts to carry off the gases to the two 55-inch diameter stacks extending above the roof of the higher building.

Transite board fire deflectors attached to the inside of the hoods by means of ⅜ by 2½-inch spacer bolts and sleeves prevent burning of that portion of the hood directly above the brick flue. In the north exterior wall, four 6 foot by 3 foot openings were provided, in which double louvres made of No. 20 galvanized steel were placed, for gravity intake of fresh air. These are constructed so as to deflect the incoming air toward the floor. The louvre sections on the room side are adjustable, permitting control during winter months.

The fan for the fresh air supply system is a non-overloading type of multiblade design, handling approximately 30,000 cfm when operating at 537 rpm by a 10 H.P., constant speed, 230 volt, DC motor, connected to the fan by a V-belt drive.

This equipment is located on a steel structure 10 feet from the floor, thus conserving valuable floor space.

Outside air is drawn in through fixed louvres designed with sufficient free area to allow for an approximate velocity of 700 feet per minute. The louvre blades are placed at 45-degree angles.

A volume louvre damper is placed in the main discharge duct for adjustment of air supply during cold weather.

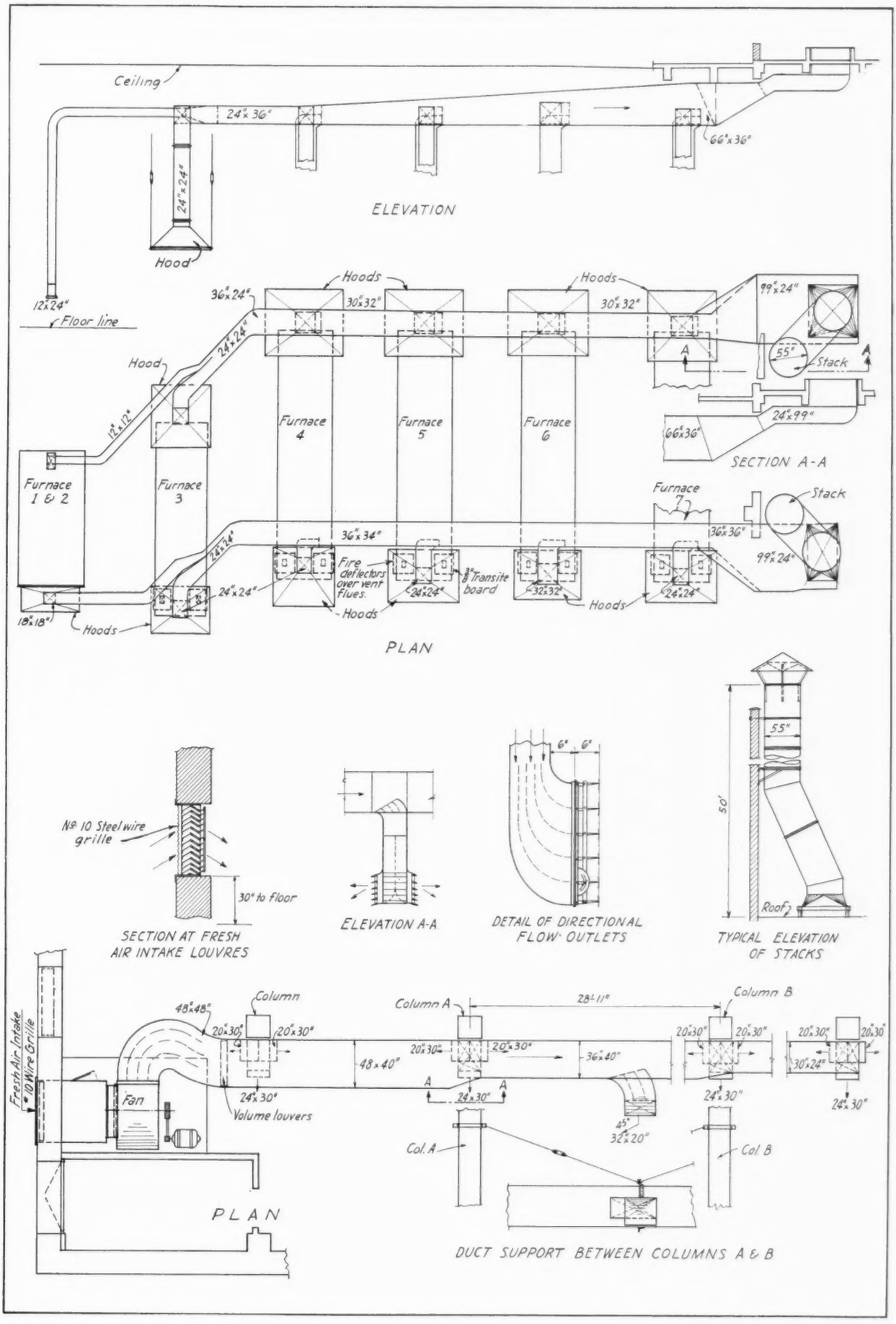
Air Supply

As indicated on the drawings, there are four downtakes, one located on the face of each of the four columns. Each downtake terminates in three special type adjustable louvred outlets, which provide directional air flow control, at the discretion of the workmen.

The remaining outlet is from the side of the main duct and is furnished with diffusers which direct the air toward the floor. All fresh air is diffused as near the floor as possible, in order that it may serve to furnish needed fresh air to breathe, and also to take advantage of the heat absorption factor of the air as it rises to the exhaust outlet at the ceiling. Considerable drop in temperature is accomplished in this manner. This outlet is constructed of No. 14 steel, is 6 feet in diameter and of similar design and elevation as the other two exhaust stacks. At the base of this stack an 8-foot by 5-foot rectangular opening in the ceiling serves as the exit for the hot air and gases that rise to the ceiling. The flow of the exhaust is accelerated by the pressure of the fresh air distributed by the fan.

The problem in ventilation in this mill was to remove a large quantity of injurious and very hot air, at the same time replacing the volume exhausted with clean, cool, outside air. Large quantities of air were needed for the air supply to the furnaces, also for the workmen. At the same time, temperatures no higher than outdoor temperatures were demanded. The sketches opposite show how these specifications were met. Note that exhaust makes use of the natural tendency to rise of very hot air.

The results attained by the operation of the ventilating system have been satisfactory to both the employees and the management, and eliminated the cause for closing this department on extremely hot days.

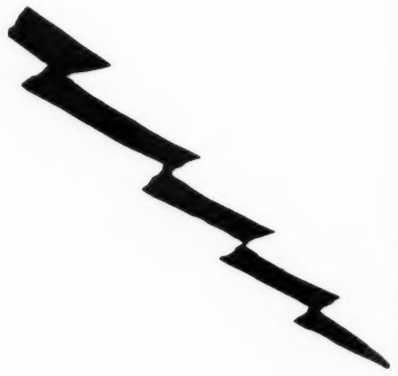

Ceiling
24"x36"
66"x36"
24"x24"
Hood
ELEVATION
Hoods
36"x24"
30"x32"
Hoods
30"x32"
99"x24"
12"x24"
Floor line
Hood
24"x24"
A
55"
Stack
12"x12"
Furnace 4
Furnace 5
Furnace 6
24"x99"
66"x36"
SECTION A-A
Furnace 1 & 2
Furnace 3
Furnace 7
Stack
36"x34"
36"x36"
99"x24"
24"x24"
Fire deflectors over vent flues.
3/8" Transite board
24"x24"
32"x32"
Hoods
24"x24"
18"x18"
Hoods
Hoods
PLAN
No. 10 Steel wire grille
30" to floor
SECTION AT FRESH AIR INTAKE LOUVRES
ELEVATION A-A
6"
6"
DETAIL OF DIRECTIONAL FLOW OUTLETS
55"
50'
Roof
TYPICAL ELEVATION OF STACKS
Fresh Air Intake
10 Wire Grille
48"x48"
Column
20"x30"
20"x30"
Fan
24"x30"
Volume louvers
48"x40"
Column A
28'-11"
Column B
20"x30"
20"x30"
20"x30"
20"x30"
20"x30"
20"x30"
20"x30"
20"x30"
36"x40"
30"x24"
A
A
24"x30"
24"x30"
24"x30"
45°
32"x20"
Col. A
Col. B
PLAN
DUCT SUPPORT BETWEEN COLUMNS A & B

New York State Contractors Are Protesting this Legislation

All contractor associations and unaffiliated contractors throughout New York state are protesting Act No. 192—Int. 189, recently introduced in the state senate, twice read and ordered printed and committed to the Committee on Affairs of Cities. The reasons for protesting this bill will be evident from a reading of the bill. The first contention (as stated by President Olear of the Buffalo Association) is that the members of the board are not qualified by experience or practice to pass judgment on who shall operate or how work shall be designed or installed. This warm air heating and warm air conditioning industry having pioneered air conditioning should have membership on the board and satisfactory recognition.

Officers of all New York state associations request the active and vocal assistance of all contractors and manufacturers doing business in the state.

We publish this act and explain the situation because like trends are becoming evident in other parts of the country and all such movements should be killed before such legislation has an opportunity to fasten itself upon this industry.



February 17, 1937.

Re:

No. 192

Introduced by Mr. GARRITY—read twice and ordered printed, and when printed to be committed to the Committee on Affairs of Cities.

AN ACT

To Amend the General City Law, in Relation to Examining Boards of Heating, General Power Pipe Fitting and Air Conditioning Contractors in Cities

Committee on Affairs of Cities
The Senate of the State of New York
Capitol
Albany, New York
Sirs:

The members of this New York State Association, composed of contractors who perform the largest part of the work required for any air conditioning job, hereby protest against the passage of this bill and ask for your cooperation.

Very truly yours,
[Signed] JAMES F. KEAYS,
President New York State Sheet Metal, Roofing & Air Conditioning Contractors' Assn., Inc.

◆

February 22, 1937.

The Honorable Anthony J. Canney
Member of Assembly
Albany, New York
Dear Sir:

Supplementing a protest by this Association to a pending Act No. 192-Int. 189 for the regulation of heating, general power piping fitting, and air conditioning contractors, it is my desire to explain more fully the definite objections to the Act and the general situation as applying to the Warm Air Heating trade.

1. The advent of air conditioning in the heating field, with the attendant handling of air, humidity, and filtering, has necessitated the use of more and greater mechanical skill in the design and installation of sheet metal duct work entering into such systems. It has also brought the Warm Air Heating type of system into high favor as being better adapted to Air Conditioning work. While there may seemingly be limitations to the size of the job which may be handled with this type of heating, the present development of Warm Air Heaters, in much larger sizes, may soon remove any limitations in this respect. At the present time there is under construction in Detroit, a twenty-six family apartment building, which is being equipped with this type of heating system.

2. The Steam Fitter having neither equipment nor experience with this particular type of heating is unqualified to set up a Code or to administer same. Nor is he qualified to pass judgment in the matter of who is qualified to conduct such business and to inspect such installation. Further, his traditional sales policy of antagonism to Warm Air Heating has prejudiced his view point.

3. In consideration of the above it would be against the interest of the general public to subjugate the Warm Air Heating Industry to such lack of experience and prejudices.

4. It is the sense of this Association that a measure regulating and Policing the Heating Industry would be most welcome to the Warm Air Heating Industry, but any legislation tending to place the Warm Air Heating Contractor in an inferior position to the Steam Fitter, is definitely objectionable and will be fought with all the resources at the command of this industry.

It is conceivable that bills of this nature will continue to be presented and we believe the controversy can be best settled and most quickly, only when the interests of the Warm Air Heating Industry are considered on an equal basis with the Steam Fitting Industry, and would be willing to cooperate to this end.

5. Relative to Article 69 of this pending Act, we believe this should be re-written or amended so that the Examining Board should include one Master Steam Fitter with not less than ten years' experience as a contractor, one Master Warm Air Heating Contractor who has had an established sheet metal and Warm Air Contracting business, exclusive of Steam Fitting or power piping for a period of at least ten years, one Journeyman Steam Fitter of like experience to Master Steam Fitters, one Journeyman Warm Air Heating Mechanic of like experience to Master Warm Air Heating Contractor, one Mechanical Engineer with at least ten years' experience supervising and designing both types of system. Relative to Article 69-H, inspectors qualifications should include five years as journeyman in the Warm Air Heating business, and such inspectors should be assigned to the inspection of such installations. Generally the other articles of the Act would seem to be acceptable.

If there is further information you wish, which this Association may be able to furnish you, it will be most pleased to do so.

Very truly yours,
[Signed] LEO J. OLEAR,
President, Buffalo Sheet Metal, Warm Air Heating and Air Conditioning Assn.

AN ACT

To amend the general city law, in relation to examining boards of heating, general power pipe fitting and air conditioning contractors in cities.

EXPLANATION—Matter in *italics* is new; matter in brackets [ ] is old law to be omitted.

The People of the State of New York, represented in Senate and Assembly, do enact as follows:

Section 1. Chapter twenty-six of the laws of nineteen hundred nine, entitled "An Act in relation to cities, constituting chapter twenty-one of the consolidated laws," is hereby amended by inserting therein a new article, to be article four-b, to read as follows:

ARTICLE 4-B

HEATING, GENERAL POWER PIPE FITTING AND AIR CONDITIONING

Section 69. Examining boards of heating, general power pipe fitters and air conditioning contractors in cities.

§ 69. Examining boards of heating, general power pipe fitters and air conditioning contractors in cities. There shall be an examining board of heating, general power pipe fitters and air conditioning contractors in each city of the state. Such board in each city shall consist of five persons to be appointed by the mayor, of whom two shall be employing or master steam fitters of not less than ten years' experience as a contractor in the busines of heating, general power pipe fitting and air conditioning, two of whom shall be journeymen steam fitters of like experience, and one shall be a mechanical engineer who has had at least ten years' experience supervising the design and installation of heating, general power piping and air conditioning systems. All members of such board shall be citizens and actual residents of the cities in which they are appointed.

§ 69-a. Term of office; vacancies. The term of office of each member of such board shall be three years from the first day of January following his appointment. Vacancies occurring by expiration of a term shall be filled by the mayor for a full term. Vacancies by death, removal, inability to act, resignation or removal from the city, shall be filled by him for the unexpired term.

§ 69-b. Compensation of members of board. The master steam fitters, journeymen steam fitters and mechanical engineer serving as members of such board shall severally be paid the rate of ten dollars per day for each day's service when actually engaged in the performance of the duties pertaining to the office; but such compensation shall not exceed ten dollars per month in a city containing less than fifty thousand inhabitants according to the last preceding federal census or twenty dollars per month in any other city.

§ 69-c. Powers and duties. The several examining boards of heating, general power pipe fitting and air conditioning shall have power and it shall be their duty: 1. To meet at stated intervals in their respective cities.

2. To adopt rules, not inconsistent with the provisions of this article, for the conduct of their proceedings.

3. To have jurisdiction over and to examine all persons desiring or intending to engage in the trade, business or calling of heating, general power pipe fitting and air conditioning contractors, or as inspectors of heating, general power pipe fitting and air conditioning, as employing or master steam and general power pipe fitters, with the power of examining persons applying for certificates of competency as such employing master or inspectors of heating, general power pipe fitting and air conditioning to determine their fitness and qualifications for conducting the business of employing master or as inspectors of heating, general power pipe fitting and air conditioning and to issue certificates of competency to all such persons who shall pass a satisfactory examination before such board and shall be by it determined to be qualified to conduct the business of employing or master heating, general power pipe fitting and air conditioning contractor or competent to act as inspectors of heating, general power pipe fitting and air conditioning.

4. To formulate a code of rules regulating the work of heating, general power pipe fitting and air conditioning, including standard specifications for materials, workmanship and manner of executing the work, and from time to time, to add to, amend or alter the same.

5. To charge and collect from each person applying for examination the sum of twenty-five dollars for each examination made by such board, and all moneys so collected shall be paid over by the board monthly into the treasury of such city.

6. To appoint and at pleasure remove such inspectors as may be necessary to carry out the provisions of this article and to fix their compensation within the amounts made available therefor by appropriation.

§ 69-d. Examinations; conducting business without certificate prohibited. The board shall conduct examinations at such times and places within such city as it may by resolution prescribe. Notice of such examinations shall be published in the official newspaper of such city once a week for two weeks preceding any such examination. A general examination shall be held in each of the months of January, April, July and October. Special examinations may be conducted without such notice. A person desiring or intending to conduct the trade, business, or calling of a heating, general power pipe fitting and air conditioning contractor, shall be required to submit to an examination before such examining board as to his experience and qualifications for such trade, business or calling, and it shall not be lawful in any city of this state, after this article takes effect, for a person to conduct such trade, business or calling, or to act as an inspector unless he shall have first obtaining a certificate of competency from such board of the city in which he conducts or proposes to conduct such business. Such certificate shall entitle the holder thereof to conduct such business or to act as such an inspector, if employed as such, in any city of the state. Any person who, when this article takes effect, is actually engaged in the business as a master heating, general power pipe fitting and air conditioning contractor shall be entitled to a certificate of competency without examination, providing an application therefor, accompanied by the required license fee, is filed with the board within ninety days after this article takes effect.

§ 69-e. Registration; when required. Every employing or master heating, general power pipe fitting and air conditioning contractor carrying on his trade, business or calling in any city of this state, shall register his name, residence and business address in the office of the superintendent of the bureau of buildings, or the office of the city clerk if there be no such superintendent of the bureau of buildings, of the city in which he shall conduct such business. Under such rules and regulations as may be prescribed by a city through the appropriate governing board, office or bureau, he shall be entitled to receive a certificate of such registration, provided, however, that each such employing or master heating, general power pipe fitting and air conditioning contractor shall at the time of applying for such registration hold a certificate of competency from an examining board of heating, general power pipe fitting and air conditioning contractors. Such certificate, when issued, shall be conspicuously displayed in the place of business of the person to whom it is issued.

§ 69-f. Cancellation of registration; notice. Such registration may be cancelled by the superintendent of buildings, or other officer issuing the same, for a violation of the rules and regulations for heating, general power pipe fitting and air conditioning of such city as duly adopted and enforced after a hearing before such superintendent of buildings or other appropriate officer, upon a prior notice of not less than ten days, stating the ground of complaint and served on the person charged with the violation, but such revocation shall not be operative unless concurred in by the local board of examiners.

§ 69-g. Expiration and renewals of certificates and license. All certificates of registration issued under the provisions of this article shall expire on the thirty-first day of December of the year in which they shall be issued and may be renewed within thirty days preceding such expiration.

(*Continued on page* 29)

Theory and Application of Resistance Welding* [Part 1]

By L. H. Frost
Welding Engineer
Electric Controller & Mfg. Co., Cleveland

ABOUT 50 years ago the first resistance welder came into being for the butt welding of rods and bars. Shortly after this, the first spot welder was built, and for many years there was not much change in the designs of spot-welding machines, though they were applied to various classes of work. More variations existed in the design of butt-welding machines than spot-welding machine because of the various shapes of pieces butt welded as compared to the flat surfaces welded by means of the spot welder.

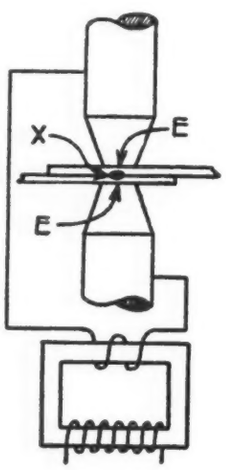


Fig. 1. Simple Diagram of Spot-Welding Process

The essential parts of a spot-welding process are shown in Fig. 1. These parts consist of a transformer and of electrodes bearing on the two work pieces (shown as sheets). The transformer changes the power obtained from the line into power of large current and small voltage in the electric circuit where the work pieces are placed.

A schematic diagram of a type of welding machine in common use is shown in Fig. 2. In actual construction the transformer is not made as shown, but either the secondary coil is wound directly over the primary coil or the primary and secondary coils are wound in sections, in order to obtain closer inductive coupling between them.

The machine shown in Fig. 2 is operated by means of a foot pedal or a hand lever, and pressure is obtained by the compression of a spring in the movable head carrying the upper electrode. Operating either the foot pedal or the hand lever forces the upper electrode against the work pieces. Further movement of the lever or pedal compresses the spring; and after a definite movement of the spring, a suitable mechanical connection with the lever causes the contacts of the pilot switch to close. These contacts, in turn, energize the operating coil of the primary magnetic switch, which applies power to the primary of the transformer, causing current to flow in the secondary coil and through the work pieces. When the operator has observed that the weld is completed, he causes a further movement of either the pedal or the hand lever. This opens the contacts of the pilot switch, thereby de-energizing the coil of the magnetic switch, which opens the power circuit, thus cutting off the current. Release of the pedal or hand lever removes the electrodes from the work, and the weld is completed.

Foot Pedal Controls Operation

Other mechanical types of machines are available, such as those having a straight arm extending across the top of the machine, in which movement of the foot pedal alone causes the welding operation to take place. Here the adjustment spring is at the rear of the machine, and after a suitable travel of the foot lever it closes contacts which may either operate a primary magnetic switch or close the primary circuit directly. As in the case of the machine shown in Fig. 2, further movement of the foot pedal opens this switch and cuts off the current.

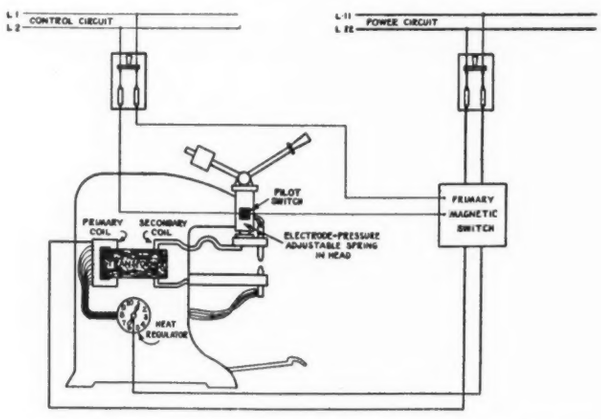


Fig. 2. Schematic Diagram of Typical Welding Machine

*Reprinted by permission of The Welding Engineer, Chicago, and the author.

The manual type of machine has been in common use for years, but for production work it was advisable to have some automatic means of repeating the welding cycle, and so motor-driven spot-welding machines were developed. In these machines, by the use of a suitable crank motion or cam motion, the operation of a clutch between the motor and the cam shaft serves the same function as operating the hand or foot lever. The most recent development in spot welders is the use of air or hydraulic cylinders in order to obtain the pressure and movement of the movable electrodes.

Current Flow Varied by Heat Regulator

All spot welders are equipped with a means of changing the amount of current flowing through the work pieces, this being commonly called the heat regulator or heat adjustment. This regulator consists of a switch arranged to select taps on the

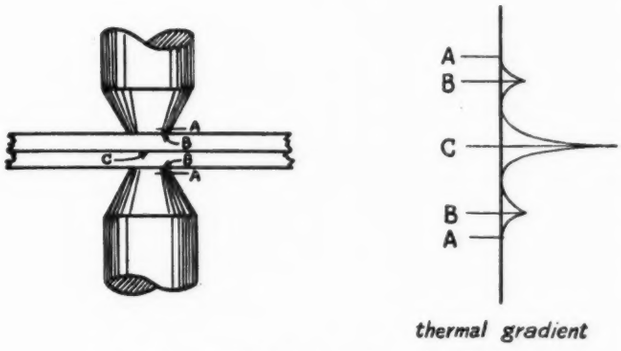


Fig. 3. Spot-Welding Set-Up and Initial Temperature Curve

primary coil of the transformer, thereby allowing the ratio of the transformer to be selected which will give the desired amount of current in the secondary coil. The common practice in the past has been to build welding machines for a maximum of 6 to 8 volts in the secondary circuit and a minimum of about 1 or 1½ volts. This range of voltage adjustment is, of course, obtained by the heat regulator.

Recent developments in welding machines have necessitated the use of higher voltages. Some modern portable machines have open-circuit secondary voltages as great as 22 volts. It should be remembered that although the voltage required to force a current of suitable magnitude through the work pieces is small, there is considerable voltage drop due to the resistance of the secondary circuit as well as its reactance. The reactance might be considered as inertia of the electric circuit, and increases with longer electrode arms, wider spacing between electrode arms and if the iron inside the secondary circuit increases.

Special Alloys Required New Machines

The early types of machines were highly successful in the welding of mild steel, but with the advent of special alloys these machines were found to be inadequate to obtain proper welds in the alloy materials.

A study of the theory of spot welding will show why these machines were used with success on mild-steel welding over a wide range of conditions, and why they are not suitable for all types of alloy welding. Fig. 3 shows two electrodes bearing on two sheets or work pieces, and at the right is shown the thermal gradient at the instant that current is applied and before the weld is made. The gradient curve shows that the heat is developed between the surfaces in contact rather than through the work pieces themselves. This is, of course, the ideal condition, since it is desired to make the weld at the point *C* rather than have the heat distributed through the pieces.

Since the amount of heat generated depends on the current flowing through the pieces and the resistance of the surface contact areas, it is evident that a change in current or a change in resistance will change the thermal gradient and the amount of heat generated at *C*.

With the standard type of resistance-welding machine, the current may be controlled by the heat regulator, but the contact resistance is determined by several factors, principal of which are: (1) surface condition of the material (rough, smooth, scaly, etc.); (2) type of material (low or high electrical conductivity); (3) shape and size of the electrode; (4) type of electrode material; (5) surface condition of the electrodes; and (6) pressure forcing the surfaces in contact.

The resistance, then, for a given problem in spot welding may be reduced to only two varying conditions, which can be controlled within reasonable limits. For the specific situation, the surface and type of the material are fixed, but the shape, size, surface and material of the electrode and the pressure on the electrode can be adjusted to suit that type of material and surface condition.

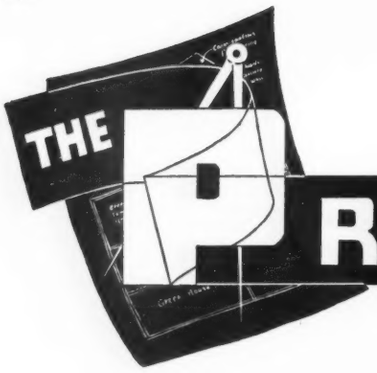
Heat Generated at Electrode Points

Reference to Fig. 3 shows that heat is not only generated at point *C* between the sheets, but also at point *B* between the sheets and the electrode. In the welding of those metals which have a resistance several times that of copper, the thermal gradient will take the shape as shown.

This, of course, is the preferred form of the gradient. In the case of metals having less electrical resistance, the points *B* increase in magnitude until, for the condition of welding copper, the three peaks become of equal magnitude. In this case, an attempt to weld is quite likely to result in welding the electrodes to the sheet as well as welding the sheets together, if any weld is made.

When welding mild steel, since this material has a resistance greater than copper, the gradient will take the form as shown in Fig. 3. It is for this reason that so little trouble has been encountered in the welding of the mild-steel alloys. In the case of the alloys having a resistance several times that of mild steel, the heat generated at point *C* is still

(*Continued on page 92*)



Your comment or experience is invited.

Removing Galvanizing

American Artisan:

We recently made a dipping tank out of 20-gauge galvanized iron, riveted and soldered. Our customer has now changed his solution and has been warned not to use this solution in a galvanized tank as the galvanizing will discolor the solution and spoil the product. Is there any practical way to remove the galvanizing without affecting the solder (50-50)?

T. B. C., Iowa.

Reply by
The Editors

We were not able to assist this reader other than to refer him to manufacturers of galvanized sheets. Has any reader suggestions as to how this process may be accomplished?

◆

Temperature Overrun in Mild Weather

American Artisan:

A friend of mine has a heating problem in which a stoker operates satisfactorily in cold weather, but in mild weather over-heats his house. The best grade of stoker coal is used. The coal feed is set at the lowest speed. When the thermostat is set at 65 degrees the house temperature holds at 75 degrees. The hold-fire is set for three minutes each one-half hour. Weeks of experiment in lengthening the period between hold-fire operation and reduction of feeding time have both failed to solve the difficulty.

P. H. B., Penna.

Reply by
The Editors

After experimenting with stoker control systems to a considerable extent this Winter, it is our judgment that you may not be able to overcome the problem outlined in your letter.

If the low speed feed of the stoker is such that you obtain combustion somewhere in the neighorhood of seven pounds of coal per square foot of grate area per hour, you will appreciate that this is producing heat at the combustion rate used to rate warm air furnaces. You will also appreciate that you are producing very high combustion chamber temperatures, and even though heat is produced only three minutes every half hour, this is sufficient to heat up the castings in the average cast furnace or the steel in the average steel furnace.

This problem remains one of the difficulties, yet to be solved with stoker fire, and the only solution lies in getting a feed rate so low that six minutes per hour of operation will not produce enough heat to warm the castings.

◆

A Drying Agent

American Artisan:

We would like to know if there is any drying agent which is practical and economical for dehumidifying air at any fixed temperature. This problem is in a commercial establishment, where farm grains are dried. The air used to ventilate and dry is circulated through the grain storage spaces and returned to the heating unit. We would like to remove moisture from the air after moisture has been picked up from the grain. We do not wish to raise or lower the air temperature.

A. C. T., Ohio.

Reply by
The Editors

We presume that you wish to dehumidify air without using refrigeration or without heating the air, and to do this, you must employ some chemical which extracts moisture from the air as the air of the space conditioned is passed over the dehumidifying material. At the present time the following materials are used for this purpose: Silica gel, Activated Alumina, and Lithium Chloride.

Silica Gel patents and equipment are controlled by the Bryant Heater Co., 17825 St. Clair Ave., Cleveland, Ohio.

Activated Alumina equipment and material is controlled by the Pittsburgh Lectrodryer Corp., P. O. Box 1008, Pittsburgh, Pa.

Lithium Chloride apparatus and material is controlled by Surface Combustion Corp., 2375 Dorr St., Toledo, Ohio.

Calcium Chloride has been advocated by some as a drying agent, but we understand the process is not entirely satisfactory in actual application, but we believe you can get full information from The Cooling and Air Conditioning Corporation, Hyde Park, Boston, Mass.

Because of the fact that these agents and the apparatus using them are fully covered by patents, it will be necessary for you to contact the manufacturers listed above.

◆

Attic Frost

American Artisan:

A customer has trouble with frost gathering in his attic. Two years ago he lined all walls, the floor and the ceiling of the attic with "Balsam Wool" thinking the insulation would remedy the condition. But the condition still persists, just as bad, if not worse, than before.

Now the house has a new roof and the ceiling of the attic is 3 feet below the peak of the roof, so there is air space above the insulation. There are two attic windows, one in either end. There is a stairway leading from the second floor, but this is kept closed. The temperature in the second floor rooms never goes beyond 65 or 70.

W. B., Minnesota.

Reply by
The Editors

We presume from your letter that the attic is not heated and because of the fact that walls, floor and ceiling are thoroughly insulated and unheated, the attic air temperature is probably identical with outside air temperatures.

If the above is correct, then the frost must result from moisture condensation of outside air or probably moisture condensation of inside air which seeps into the attic and is reduced to outside air temperatures resulting in frost formation.

The attic is probably not air tight and air may leak into the attic from the door you describe or through some other openings and upon being chilled to outside air temperature, deposits moisture in the form of frost. The only thing which can be done is to heat the attic room.

If this attic is not used, we do not see any particular objection to the frost unless upon melting it results in moisture, but our knowledge of winter climate in your part of the country leads us to believe that outside temperatures are below freezing during many weeks of winter and there can not be much water formation.

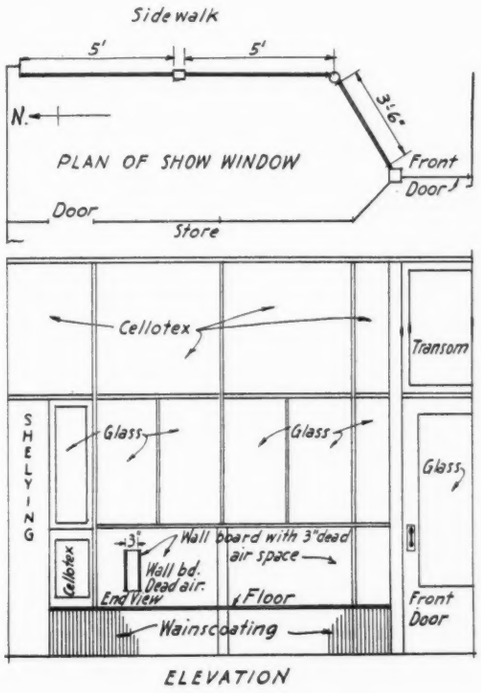
The Problem Corner . .

Store Window Frosts Over

American Artisan:

Last fall, in order to conserve heat in our store, and to keep our display window from frosting over when the weather gets cold, we placed a back in the window making this back air tight. The idea was to keep warm air from the store out of the window area. The result has been that we do conserve heat, but the window still steams and frosts over.

As shown in the sketch, we have an east exposure and the glass is set in wood frames, two frames being 5 by 10 feet and the small window 3½ by 10 feet. To the best of our knowedge there is no air circulation in the window area. At the slightest change in temperature, especially as outside temperature drops the glass begin to steam up so we cannot see out and when the temperature drops still farther the



glass frosts over. Yesterday morning when entering the store with an outside temperature of zero the temperature in the window area was 18 above and in the store 65 degrees. If the cold continues for some time the frost tends to disappear at the very edges, but never for more than 1 or 2 inches.

Can we eliminate this steaming and frosting?

S. M. S.

Reply by The Editors

This problem of condensation on interior surfaces of glass is one of interest to many investigators. There are on the market a number of types of double glazed windows in which the two panes of glass are held apart approximately ¼ of an inch or less, and the edges are sealed after the air is exhausted from between the glass. You will say, naturally, that if the vacuum is established and the glass is sealed, there certainly should be nothing to cause condensation, yet in a model home in Detroit last winter, practically every pane of glass of this type in the West, North and East exposure was clouded over.

Interesting also is the assertion of the engineer living in the house that this condensation appeared on the first cool day and had never left the glass between then and March. The only way he can account for this is that it is impossible to fully exhaust air in a sealed space and that leaks occur due to vibration and that once this moisture gets in, it clouds over or frosts, according to outside temperature conditions.

With this in mind, you can appreciate how difficult it is for you to prevent condensation in the store window where you have the frames several feet apart as shown on your plan.

We do believe that you can prevent condensation by this construction and you will have to do one of three things:

1. Introduce warm dry air into the space between the glass partitions in sufficient volume to keep the inside surface of the outside glass above the dew point of the air. In other words, approximately 40 deg.
2. Introduce cold air from the outside into the space on the theory that although this outside air may be 100 per cent saturated outdoors, it will contain very little moisture when heated to room temperature and therefore will not deposit moisture on the cold glass.
3. Place some sort of a fan in the space to maintain an air movement over the glass just as they do in grocery store windows.

◆

Brick Wall Leaks

American Artisan:

We are having trouble with leaks in a brick veneer house wall. The brick have a very dense, smooth surface and do not absorb any water in a 24-hour period. The bricks are not glazed. The bricks are laid up in a 3/16-inch butter joint by good workmen. Can you offer any suggestions?

H. M. M., Illinois.

Reply by The Editors

The difficulty outlined in your letter is a common problem with dense surface brick, especially where the mortar joint is not as water repellent as the brick. Our only suggestion is that you obtain application data for one of the waterproofing compounds available. We suggest the following firms:

Ceresit Waterproofing Corporation, 511 South Canal St., Chicago, Illinois.

Imperial Waterproofing Company, 220 South State St., Chicago, Illinois.

Ironite Company, 111 W. Washington St., Chicago, Ill.

Cochrane Chemical Company, 442 Danforth Avenue, Jersey City, New Jersey.

Anti Hydro Waterproofing Co., 295 Badger Avenue, Newark, New Jersey.

Goheen Corporation, 46 Albert Avenue, Newark, New Jersey.

◆

Heat Booster

American Artisan:

Writes Otis H. Reed without giving any address—Can you tell me the names of manufacturers of a small fan which is designed to be installed upon or in a warm air leader pipe to accelerate the flow of warm air in that pipe? Kindly mail descriptive matter.

Reply by The Editors

As Mr. Reed did not give us any address or firm name we could not write. If we are not too late, we suggest that the following manufacturers make a fan for the job he wishes done:

A-C Manufacturing Co., Pontiac, Illinois.

American Foundry & Furnace Company, Bloomington, Illinois.

Cary Manufacturing Co., Waupaca, Wisconsin.

Emerson Electric Mfg. Co., 500 N. 21st St., St. Louis, Mo.

Forct Air Co., Rockford, Illinois.

Victor Electric Products, Inc., 748 Reading Rd., Cincinnati, Ohio.

Dehumidifying Coils Incrusted From Soap Dye in Air

By J. W. Baybutt
Instructor, Rochester Athenaeum and Mechanics Institute

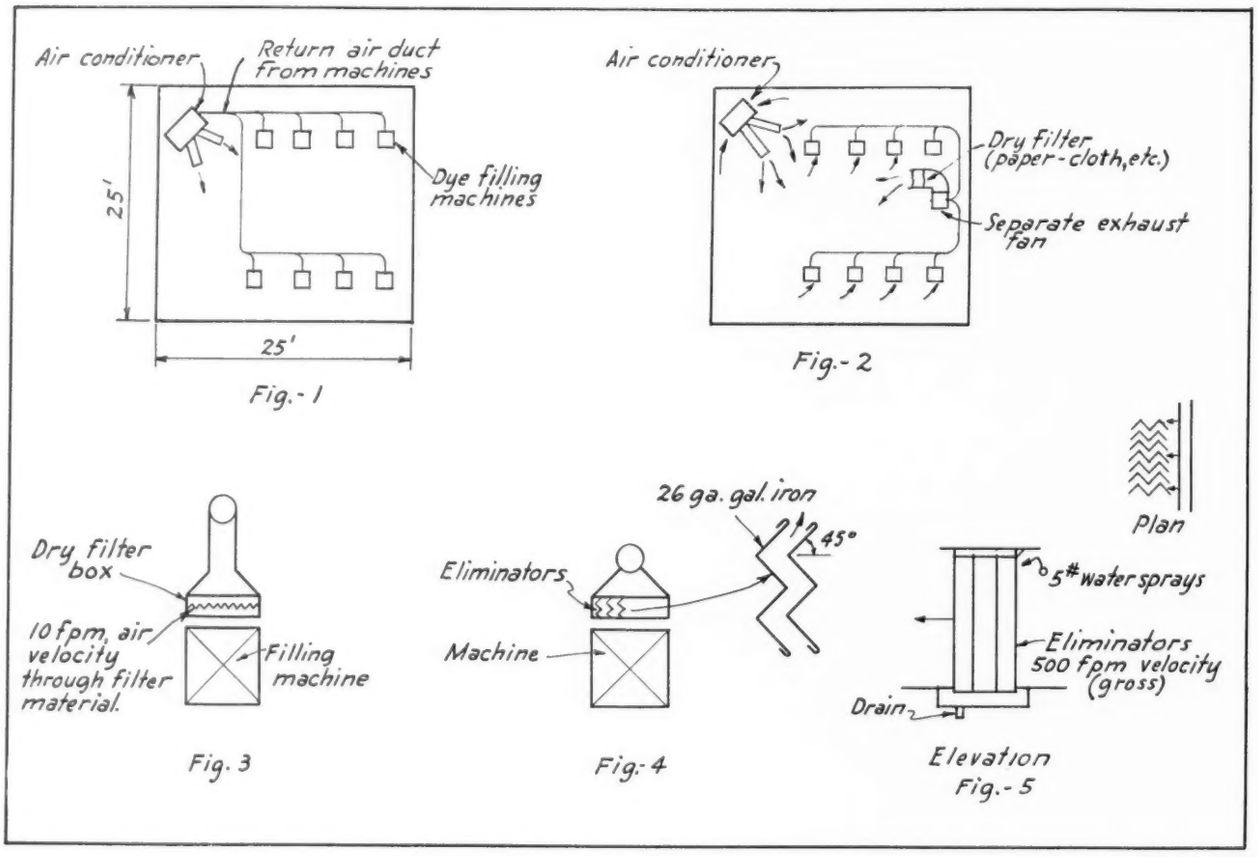
A PROBLEM submitted by a reader of American Artisan involves the collection of dye materials in a processing plant. The reader states—"We have a problem of material collection in a local soap dye plant. The trouble is in a room where small envelopes are filled with various dyes. The room is about 25 by 25 with a 9-foot ceiling. Last year the manufacturer installed a dehumidifier to keep the room at the proper humidity so that work could be carried on under all weather conditions. We believe that salt is used in the process. The dye filling machine was connected to the intake side of the dehumidifier, so as to clear the air as much as possible.

"The dehumidifier works fine; causing about three gallons of water per day to be deposited out of the air. The trouble is the dyes pass through the filters making a fine, muddy mess around the coils.

"How can we collect the dye dust before it gets to the dehumidifier. At present we pick up the air at the filling machines and exhaust the air back into the room after dehumidifying. The room is fairly air tight, with double doors."

In working out this problem some factors must be pictured since the reader did not submit a sketch of the layout.

Fig. 1 shows a plan of the room as we imagine it to be from the subscriber's description. The first thought which comes to mind in the solution of this problem would be to recommend separating the exhaust system from the air conditioning system as shown on Fig. 2. The exhaust would be cut down to a minimum with the suction nozzles located as close as possible to the dust origin. Dry filters



could be used with a possible dye recovery worth the added installation expenditure.

If the air conditioning unit has sufficient capacity, it might be well to consider exhausting the air to the outside with a makeup air connection to the unit from the outside to allow for the air exhausted. This arrangement, of course, will increase the operating cost, but will insure better air conditions for the operators.

Assuming that the unit has to accomplish both purposes, the writer would recommend that dry filters be installed at each machine inlet with easy access for cleaning or replacing as shown in Fig. 3. Paper filters have been used in many similar cases with successful results. Additional fan speed will be necessary to offset the added resistance offered by the filters to maintain the same air flow conditions.

In somewhat similar installations the writer has used ordinary galvanized iron eliminators as shown on Fig. 4.

In one recent installation these eliminators had to be cleaned twice a day, but they were very effective in holding the dirt from the system. Addition of water flooding nozzles on such a type of eliminator would probably further aid separation as suggested in Fig. 5. This method would be better incorporated in a central unit to handle all the machines and located just ahead of the air conditioning unit.

New York Examining Boards

(*Continued from page* 23)

Such renewals shall be for one year from the first day of January in each year.

§ 69-h. Inspectors; qualifications. The inspectors of heating, general power pipe fitting and air conditioning shall be practical mechanics who shall have served at least five years as journeymen at the business, trade or calling of heating, general power pipe fitting and air conditioning, and their compensation shall not be less than the prevailing rate of wages in the respective cities of the state in which they are appointed.

§ 69-i. Duties of inspectors; reports. The duty of the inspector or inspectors appointed under the provisions of this article, in addition to the duties prescribed by law and those which may be required by the superintendent of buildings or other department, board, officer or commission of the city in which they are appointed, shall be to inspect the construction and alteration of all heating, general power pipe fitting and air conditioning performed in such city, and to report in writing the result of such inspection to the superintendent of buildings, or other department, board, officer or commission of the city, as the case may be. They shall also report in like manner any persons engaged in carrying on business of employing heating, general power pipe fitting and air conditioning contractor without having the certificate herein provided.

§ 69-j. Notice of violation of rules. Whenever any inspector or other persons report a violation of any of such rules and regulations for heating, general power pipe fitting and air conditioning or a deviation from any officially approved plan or specification for heating, general power pipe fitting and air conditioning filed with any board, bureau or department, the local board, bureau or department of buildings shall first serve a notice of such violation on the employing or master heating, general power pipe fitting and air conditioning contractor doing the work, if registered in accordance with the provisions of this article.

§ 69-k. Notice, how served; proceedings when violations not removed. Such notice may be served personally or by mail, and if by mail it shall be addressed by registered mail to such employing or master heating, general power pipe fitting and air conditioning contractor at the address registered by him with the local board, bureau or department of buildings but the failure of the heating, general power pipe fitting and air conditioning contractor to register shall relieve any board, bureau or department of buildings from the requirements of giving notice of violations. Unless the violation is removed within three days after the day of serving or mailing the same, exclusive of the day of serving or mailing, the board, bureau or department of buildings, may proceed according to law.

§ 69-l. Office room; expenses a city charge. Each of such examining boards of heating, general power pipe fitting and air conditioning contractors shall have power to procure suitable quarters for the transaction of business, to provide the necessary books and stationery, and to employ a clerk to keep such books and record the transactions of such board, whose compensation shall be fixed by such board within the amount made available by appropriation therefor. The board of estimate and apportionment of a city, the common council or other appropriate body, as the case may be, shall annually insert in the tax levy a sufficient sum to meet all expenditures incurred under the provisions of this article. The expenses incurred by the several examining boards of heating, general power pipe fitting and air conditioning contractors in the execution and performance of the duties imposed by this article shall be a charge on the respective cities and shall be audited, levied, collected, and paid in the same manner as other city charges are audited, levied, collected and paid.

§ 69-m. Violations; how punished. Any person violating any of the provisions of this article or any rules or regulations of the examining board of heating, general power pipe fitting and air conditioning contractors, or of the superintendent of the bureau of buildings, boards of buildings, bureau, department or officer in any city regulating the heating, general power pipe fitting and air conditioning in such city, shall be guilty of a misdemeanor, and on conviction of an employing or master heating, general power pipe fitting and air conditioning contractor, he shall, in addition, forfeit any certificate of competency or registration which he may hold under the provisions of this article.

§ 2. This act shall take effect July first, nineteen hundred thirty-seven.

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Mechanic Wants Work

A letter recently received from a mechanic says: "I have 17 years of experience in a tin shop in a small town where we do everything from putting a wire in a milk strainer to putting on tin roofs and installing air conditioning furnaces. I am 39 years old, in good health and do not drink, smoke or chew. I am a graduate of grammer school and have acted as foreman over three and four mechanics. I have figured and sold all kinds of sheet metal and heating work and fabricated and installed all types of metal work.

"I have two children nearly ready for college and would like to secure steady employment in a college town at a wage which will put the children through college and permit me to live.

"I do not hold a union card, but am willing to join a union if this is necessary."

We publish this request with the suggestion that any contractor suitably located and needing a mechanic can write us in detail and the letters will be forwarded to the writer of the letter.

Social Security

By Joseph G. Dingle
C. P. A., Ottawa, Ill.

Mr. Joseph G. Dingle, C.P.A.
Ottawa, Ill.
Dear Sir:

Our February American Artisan came today, and the writer has been studying your article, "New Duties for Employers," the best and clearest that we have been able to find thus far. You are certainly familiar with your subject, and we are taking the liberty of coming to you with two or three questions. The Assistant Postmaster is the one who is supposed to be best informed here, but he has only general information and could not help us. We had to write to the Internal Revenue Collector at Wichita for a blank for our 1936 report and accompanied the request with some questions; the blank came and a short letter advising of the April 1st filing date, but if there is to be a reply to the questions they are very slow about sending it.

The most important point about which we wish to be enlightened is the working for us by customers to pay their old accounts. The instructions are plain enough, of course, that labor paid for in merchandise is the same as though paid for in cash, but must we be taxed for labor done for us in 1936 or 1937 which we paid for in merchandise long before social security was even thought of? We have been in business a long time and this section of country has been so hard hit by depression, drouth, grasshoppers, etc., that the only way a very large number of customers can pay their old accounts is by working for us. Being in the plumbing business there are pipe ditches to dig, and often we can send an outside man as helper to one of our regular mechanics. Probably every carpenter in the town owes us, and often we can give them work. During 1937 this is going to be quite an item perhaps, as we are considering repairing the roof and cementing the floor of the basement of our large store building. All labor will be by people owing us on account for labor or merchandise furnished them prior to 1936. From our standpoint the tax on this would amount to a nice discount upon the old sales, in which already all profit is gone.

What is the status of the wife of an owner of a business if she does office work for the owner but does not receive pay? Does she count as an employee? How does it affect matters if she is part owner?

Our business is one of those employing "six or seven individuals normally"; we started 1936 with nine, kept eight during the summer months, and ended the year with seven, our present number besides our two selves, and occasionally there was extra work by customers working out bills. One regular employe was past 65 and working only about 2 hours per day: you have furnished us information about him in the Artisan. We have our 1% tax to pay for 1936, of course. At present we are so nearly on the line for 1937 that we wish to be careful. If we have, say, a sewer ditch to dig and let an outsider do it by contract (we usually pay by the foot), is the digger an employee of ours and are we both subject to the tax? Should the contract be in writing as a matter of proof? Such contractor would likely have had his pay before 1936 started. It is often the case that these customer-workers ask for and receive some cash to tide them along.

You stress the importance of keeping track of time. Five of our seven report hours daily and are paid according to the number of hours. Two, who are salesmen, do not report; they are paid a certain sum each Saturday night; if sick they receive the same pay, and if they are off for some errand of their own during the working day it is not kept track of either. May this make trouble?

We pay on Saturday nights. January and February end then, but March and other months do not; we suppose we report by April 30th money paid during March up to and including March 27th, and that March 29, 30 and 31 are to be reported by May 31st. Right? Or must we pay at close of March 31st and include in the April 30th report?

How would a man who receives a commission upon say an automobile sale be considered, such man not being an employee?

There will be other questions to bother us probably, but if we can be set right concerning these we probably can understand fairly well. It did not occur to us until tonight that we do not know what a "calendar week" is; a year has 52 weeks, but we are wondering now if 1937 does not have 53 "calendar weeks," as well as 1936, the only difference this would make being in the counting of those twenty important days in different calendar weeks.

We shall certainly appreciate hearing from you by letter or through the pages of the Artisan next month on things like this, and we thank you in advance and for the information you already have given.

Yours very truly,
[Signed] H. R. K.

◆

IT IS the purpose of these articles in American Artisan and of the writer to present timely discussions on live subjects and, as you know, this Social Security Act has been discussed in the Artisan since May of last year.

Your Postmaster, like many others, also like many employees of the Federal Social Security Board, has not prepared himself to properly aid taxpayers in the many problems presented. You may find it interesting to reread the series of articles on Social Security, now that you have come face to face with the Act as it applies to your own business.

We shall give you our own interpretation of the several questions asked:

Customers Working Out Accounts

These customers, performing work for you in your regular line of work, are employees. While it, at first glance, appears to be a tax on a prior year's business, the work these customers do is actually in 1937 and is such as would otherwise be done by employees who would be paid in cash.

As to the roof repairs and concrete floor, it is possible you could let this work out by contract to the workmen who are indebted to you and thus not be their employer. We attach hereto a copy of the Regulations defining an employer. Any customer who might work for the carpenter contractor could be paid by credit on his account with you.

Status of Wife Working for Husband

"The tax under the Social Security Act is imposed upon wages; therefore the wife of the owner of the business, or anyone working for him who does not receive wages in any form, is not taxed nor is she considered an 'employee.' You asked regarding part ownership of the business—members of a partnership are considered employers, therefore if a wife is a part owner in the sense of being a partner she is an employer rather than employee."

Necessity for Records

It is important that all employers keep more or less detailed records covering their employees and their compensation.

First, you must be able to prove to Revenue Agents that you have properly paid your tax and that withheld from the employees. These records must be preserved for at least four years after date of payment of such compensation.

Second, in July, 1937, you will be called upon to file "information returns" for each employee, both regular and transient, showing in detail the wages earned from January 1st to June 30, 1937, the tax withheld, and your payments to the Collector of Internal Revenue. Thereafter, you will be required to file these "information returns" quarterly.

Third, you will require data as to the days on which employees worked—as well as hours worked—in order to determine your liability for the Unemployment Compensation tax—which applies to all employers of 8 or more.

We can see no danger of trouble because of the fact that your salesmen keep no particular hours. Of course, they are on duty and count as employees on each day of the business week. Your workmen, reporting on hourly basis, are employees only on the days they work. For instance, you may have 8 men on your weekly pay roll but still have only seven employees for the week. Such a condition would arise where one of your hourly men may work, say Monday to Friday, but be off on Saturday, and you would take on for Saturday a man to replace the regular employee. Thus, on each day you would have only 7 men. But, because of the weekly basis of pay for the salesmen, these men are presumed to work every day.

Pay Periods

It is not necessary that you split the pay period. As you pay on Saturdays, you will prepare your form SS-1 to show wages and salaries actually paid within the calendar month. Of course, January 2nd, 1937, being Saturday, you owe taxes on only the 1st and 2nd of January, but none on the few days in December paid on January 2nd.

Commission on Automobile Sale

"The act says that all commissions are taxable. If such a man were an 'independent contractor,' buying the cars from you and independently selling them, his profit would not be taxable. If he sells cars for you upon any other basis he must be considered an employee and his commissions taxed accordingly."

Calendar Week

"A calendar week means the seven days—Sunday to Saturday inclusive. Since you pay on Saturday night you are paying by the 'calendar week.' Each year has but fifty-two calendar weeks."

Eight or More Employees

"In order to avoid having eight or more individuals employed for more than twenty weeks during the year, you must watch your pay roll carefuly and if in one week it is absolutely necessary to employ eight individuals, try to group this extra work together, as much in one calendar week as possible. In other words, under the act it would have the same effect if you employed twenty men for six full days or the eighth man for one hour that week.

"As stated above if you could arrange to have some of your work done by an independent contractor, such a man is not an employee of yours and therefore you are not subject to the tax. As proof of whether a man is an employee, the act states that in the relationship of employer and employee it is not necessary that the employer actually direct or control the manner in which the services are performed, but he must have the right to do so. The right to discharge is also an important factor in determining employer-employee relationship, but if an individual is subject to the control or direction of another, merely as to the results to be accomplished by the work and not as to the means and methods of accomplishing the results, he is an independent contractor. Although the law does not definitely state that there must be a written contract as proof, I believe you would be on the safe side to have one drawn up in matters of this kind."

The pay roll records illustrated and discussed in our February article were designed by us and are carried in stock by the Illinois Office Supply Company, Ottawa, Illinois.

◆

(5507) Art. 3 Who are employees.—Every individual is an employee within the meaning of Title VIII of the Act if he performs services in an employment as defined in section 811 (b) (see article 2).

However, the relationship between the person for whom such services are performed and the individual who performs such services must as to those services be the legal relationship of employer and employee. Generally such relationship exists when the person for whom services are performed has the right to control and direct the individual who performs the services, not only as to the result to be accomplished by the work but also as to the details and means by which that result is accomplished. That is, an employee is subject to the will and control of the employer not only as to what shall be done but how it shall be done. In this connection, it is not necessary that the employer actually direct or control the manner in which the services are performed; it is sufficient if he has the right to do so. The right to discharge is also an important factor indicating that the person possessing that right is an employer. Other factors characteristic of an employer, but not necessarily present in every case, are the furnishing of tools and the furnishing of a place to work, to the individual who performs the services. In general, if an individual is subject to the control or direction of another merely as to the result to be accomplished by the work and not as to the means and methods for accomplishing the result, he is an independent contractor. An individual performing services as an independent contractor is not as to such services an employee.

Generally, physicians, lawyers, dentists, veterinarians, contractors, subcontractors, public stenographers, auctioneers, and others who follow an independent trade, business, or profession, in which they offer their services to the public, are independent contractors and not employees.

Whether the relationship of employer and employee exists will in doubtful cases be determined upon an examination of the particular facts of each case.

If the relationship of employer and employee exists, the designation or description of the relationship by the parties as anything other than that of employer and employee is immaterial. Thus, if such relationship exists, it is of no consequence that the employee is designated as a partner, coadventurer, agent, or independent contractor.

The measurement, method, or designation of compensation is also immaterial, if the relationship of employer and employee in fact exists.

Title VIII of the Act makes no distinction between classes or grades of employees. Thus, superintendents, managers, and other superior employees are employees. An officer of a corporation is an employee of the corporation, but a director, as such, is not. A director may be an employee of the corporation, however, if he performs services for the corporation other than those required by attendance at and participation in meetings of the board of directors.

Because of the need for information on specific problems of the new tax laws arrangements have been made with Jos. G. Dingle to answer readers' questions. Questions should be as specific and complete as possible.

The Michigan Convention

THE 26th annual convention of the Michigan Sheet Metal & Roofing Contractors Association, held March 2, 3 and 4 in Grand Rapids, reflected the general optimism of business, specifically business in the sheet metal, warm air heating and air conditioning industries, and provided a program in which each speaker brought his subject down to an example and problem basis, thus giving contractors usable information, with plenty of time for questions and answers. As a result of this effort of the program committee to provide a practical meeting, dozens of contractors were heard to remark that the 1937 convention was the most usable ever held by the Michigan Association.

Air Conditioning

The first day of the open sessions was devoted entirely to discussions of air conditioning. Under the leadership of Fred Bishop the new mechanical warm air heating code was presented to the convention and discussed in detail by three speakers—Fred R. Bishop, Detroit; Bruce McLouth, Lansing; and Ed Root, also of Lansing.

Fred Bishop explained briefly some of the history of the Standard code and the mechanical code for warm air heating and explained the limitations of these codes and just why the industry believed the new mechanical warm air heating code based upon Btu terminology was necessary.

Heat Loss

Since Btu heat loss for any structure must always be the first problem considered in the planning of a mechanical warm air heating system, Ed. Root explained the general principles of heat transfer showing how radiation as a heat loss factor is encountered only as bodily radiation to cold surfaces occurs. He explained that conduction is an important factor in heat loss, since loss of heat by conduction takes place through glass, walls, ceilings, floors, basement walls above grade and basement walls below grade. Also that convection is highly important, since convection covers two large sources of heat loss—infiltration and exfiltration.

Referring to table 2 of the new mechanical heating code, which presents the conductivities and conductances of common building materials and common building constructions, Mr. Root explained that the conductivities are expressed in Btu per hour per square foot of surface, per degree difference per inch of thickness where the material is homogeneous all the way through; whereas conductances are given in the new code for the thickness or conditions stated and not per inch of thickness, and the wall construction may not be homogeneous all the way through.

Taking a typical room 23x13x8½ feet, giving a content of 2,640 cu. ft. and having a wall composed of ½ inch of gypsum lath, ½ inch of rigid insulation, $\frac{13}{16}$ inch of siding and $\frac{13}{16}$ inch of sheathing, one air space with still air on the inside and 15 mile per hour wind on the exterior, the heat loss or the conductance of the wall was figured. The conductance according to Table 2 of the new code appears as follows, according to the individual thickness of the material used.

TABLE 1

Wall Material	Material Thickness	Material Conductivity	Actual Conductance
Gypsum Lath	½ in.	$\frac{.5}{.33}$	1.51
Rigid Insulation	½ in.	$\frac{.5}{.33}$	1.51
Wood Siding	$\frac{13}{16}$ in.	$\frac{.781}{.80}$	.975
Sheathing	$\frac{13}{16}$ in.	$\frac{.781}{.80}$	.975
Air Space	$3\frac{5}{8}$ in.	$\frac{1}{1.10}$	.909
Still Air (Inside)		$\frac{1}{1.65}$	.606
15 Mile Air (Outside)		$\frac{1}{6}$	.167
Total Heat Loss of Wall			5.29

The particular room shown in the problem had windows on two sides and Mr. Root explained that since the wind can blow directly upon the wall from only one direction at one time, the wall having the greatest exposure or, in other words, the largest infiltration is used, excepting where the infiltration of the wall selected is less than one-half the total infiltration of all walls. This particular room had 330 sq. ft. of gross wall area and 69 sq. ft. of glass area, leaving 261 feet of net wall area. Mr. Root explained that the code gives infiltration as 40 cfm per foot of crack for good window construction, but that because windows do not stay tight, he himself uses 50 cfm per foot of crack. The particular infiltration figured on this basis showed 2,700 cfh of air leaking into the room.

It was here explained wherein this code is more accurate than the standard code for gravity, which

uses 1½ air changes per hour. The particular room in the problem figured at 1½ air changes per hour would show a loss from 3,940 cu. ft. per hour for infiltration as compared to the 2,700 cu. ft. per hour under the more accurate code. This particular problem house was designed for a temperature of 70 deg. indoors at —10 deg. outdoors and the heat loss for glass, walls and infiltration would look like this:

	Btu per hr.
Glass .....= 69 × 1.13 × 80° Td =	6,225
Wall .....= 261 × .19 × 80° Td =	3,960
Infiltration = .245 × .0745 × 80° × 2,700 =	3,880
Total .....=	14,065

Air Change

Carrying on from heat loss calculations, Fred Bishop declared that one of the most important provisions of the new code is that section referring to the relationship between Btu losses for the house, air changes per hour, and register temperature. Mr. Bishop explained that common practice selects a register temperature and calculates the cfm required per room according to this register temperature (sometimes corrected for temperature drop in ducts, sometimes not corrected). He explained that where houses are insulated, the heat loss may be low and to use the same register air temperature as might be selected for an uninsulated house results in a condition where we have one or two air changes per hour in place of the five or six air changes per hour which we consider essential for good ventilating purposes. Mr. Bishop explained that the new code suggests having five or six changes of air per hour, without regard to the actual heat loss of the individual room.

Naturally, this results in generally lower register air temperatures for insulated houses than may occur or can be used for uninsulated houses, but this should not be objectionable, providing the register air temperature does not drop so low as to feel chilly. Mr. Bishop further explained that the use of suitable types of deflecting registers or the location of registers above the breathing line will permit the use of higher velocities and lower register air temperatures and insure the adequate ventilation desired.

Register Temperature and CFM

The new mechanical code provides in Fig. 1 a cfm series of factors which can be used to determine the register air temperature for certain cubic capacities as follows:

$$\frac{1{,}600 \text{ cu. ft.}}{110{,}000 \text{ Btu}} = 0.0145 = 137° \text{ register temperature}$$

$$\frac{1{,}600 \text{ cu. ft.}}{90{,}000 \text{ Btu}} = .0178 = 122° \text{ register temperature}$$

The 110,000 Btu loss is for an uninsulated, while the 90,000 Btu loss is for an insulated, house.

Having determined the factor from Fig. 1—as, for instance .0178 (above)—this factor is found across the bottom of Fig. 1, and by moving upward to the intersection with the temperature line and then across to the left the actual register temperature will be determined directly from the chart.

Using the example of the 23 × 13 × 8½ (2,640 cu. ft.) of the problem house on the blackboard, the chart shows that the 14,000 cu. ft. times .0145 would equal 210 cfm, whereas 14,000 cu. ft. times .0178 would require 248 cfm, with 137 and 122 deg. register temperature respectively.

A typical one-trunk line duct with six branches with one branch at 10, another at 20, another at 30, another at 40, another at 50, and the last branch at 60 ft. actual distance from the furnace bonnet was used to show the effect of temperature drop. Mr. Bishop recommended that .4 of a deg. drop per foot be used for the velocities and range of register temperatures recommended by the code. The actual register temperatures which would then figure out for the registers at the distance mentioned above would be 142½ deg., 140 deg., 137 deg., 135 deg., 132½ deg., and 130 deg. for the last register 60 feet from the furnace when the bonnet temperature is maintained at 145 deg.

Using these actual register temperatures on Fig. 1 and working the chart backwards gives respective factors for the registers beginning at the furnace of .0136, .014, .0145, .0149, .0151, and .0158 respectively. These factors, multiplied by the heat loss of each individual room, would determine the actual number of cu. ft. of air per minute required to heat the rooms with the register temperature actually in existence.

Sizing Ducts

At the beginning of the afternoon session, Bruce McLouth defined the limitations of the new code as 250,000 Btu heat loss and 5,500 cfm, and recommended that where larger structures are encountered or where the building is more than three stories high, engineering advice should be requested.

Mr. McLouth placed upon the blackboard a very simple one-trunk duct system with five branches off the main trunk and explained how to use the friction chart for determining the resistance of the run having the greatest resistance and using this resistance as a design basis how to size branches and trunk lines so that the calculated cu. ft. of air per minute will be delivered without setting the cut-off dampers.

One of the interesting problems introduced by Mr. McLouth was a register on the second floor 60 feet from the bonnet and requiring 175 cfm. Mr. McLouth explained that in ordinary practice and according to the old code, probably 2 stacks would be used in this room due to the fact that pipe sizes were read in terms of 100 ft. from the standard friction chart, but actually because the register is only 60 ft. from the furnace, the actual resistance encountered in the trunk line and stack will make

it possible to deliver 175 cu. ft. of air per minute through a standard 3½x14 in. stack without raising the resistance of the system beyond .08, which was the desired resistance, thus eliminating the use of one stack.

It might be stated that the procedure recommended in the new mechanical code is based upon the same principles as recommended in American Artisan for the last several years, using a design procedure based upon equal friction per running foot of duct and sizing the branch pipe for percentage of reduction of main and branch pipe sizes as shown in two charts in the ASH&VE Guide.

The particular system used as a problem by Mr. McLouth had the first register 20 feet, the second register 60 feet (the second floor), the third register 50 feet, the fourth register 60 feet and the last register 160 feet from the furnace, and the problem is shown in the following table.

TABLE 2

Cfm	Round Pipe Dia. Not Corrected	Equivalent Length of Pipe	Correction Factor Table 9	Actual Round Pipe Dia.
100	6.4	160 (End Branch)	1.09	7.0
175	8.0	70	.93	7.44
275	9.4	—(Main Trunk)	1.09	10.3
150	7.5	50	.87	6.5
425	11.0	—(Main Trunk)	1.09	12.0
140	7.3	60	.905	6.6
565	13.0	—(Main Trunk)	1.09	14.2
120	6.9	20	.725	5.0
685	13.9	—(Main Trunk)	1.09	15.2

Motor Troubles

E. D. Dewey of the Century Electric Company, speaking on the subject of motors, declared that motor trouble arises from three chief troubles: one, faulty motors; two, motor overloading; and three, low voltage line conditions. Mr. Dewey declared that trouble No. 1 can be eliminated only by purchasing a satisfactory motor, but troubles two and three can generally be eliminated if adequate protection is afforded the motor. He declared that such protection is not provided by ordinary fuses because the home owner may increase the size of fuse used and thus destroy the fuse protection and that the only satisfactory protection is a thermal cutout which will stop the motor should any trouble arise on the line, or the motor become overloaded. He also recommended that where the basement blower is to be used for summer cooling, being speeded up by increasing the size of the pulley, the contractor should watch for motor overload conditions, and protect his installation with a thermal cutout as the larger volumes of air handled will very frequently overload a motor which is just under the overload condition when run for winter heating.

Michigan Short Course

Professor L. G. Miller of Michigan State College presented a short discussion of the general educational aims of the next Michigan State College Short Course in warm air heating and air conditioning to be held the last three days in March and the first day in April at East Lansing, Michigan, and publicized in previous issues of American Artisan.

Social Security

On Thursday, S. R. Berkley, speaking on the subject of social security, made the interesting assertion that there is contained in the Social Security Act provision for setting up ways and means of finding employment for unemployed persons during times of depression through such agencies as WPA, PWA, etc. He explained, in detail, forms 940 and SS1, covering unemployment compensation and old age insurance benefits, explaining how these forms should be filled in and when they should be mailed.

Of particular interest to the Michigan contractors attending was Mr. Berkley's discussion of the Michigan State act which supplements the Federal Act, particularly on unemployment compensation. Under Michigan law every employer of one or more (as compared to 8 or more in the Federal act) is subject to tax for unemployment compensation at the same rate as listed in the Federal act. He explained that due to this provision many contractors in Michigan will pay an unemployment compensation tax to the state when they are not eligible for tax payment under the Federal Act. He also explained that in Michigan there is a merit rating and that each employer has his own individual account, so under the Michigan act tax payments may be reduced when the fund of the individual employer reaches certain proportions. Also under the Michigan State act, the tax limit is $3,000 a year for wages for each single employee.

Michigan Sales Tax

Paul H. Reynolds, speaking on the Michigan sales tax, outlined the history of the tax which started in July, 1933, and declared that the first writing of the act was perfectly clear, but that subsequent rulings by the State Board of Tax Administration and some State courts have resulted in confusion, particularly those rulings covering who is the actual ultimate consumer. According to Mr. Reynolds, as the law now stands, the furnace contractor is the ultimate consumer of furnaces and furnace equipment and the sheet metal contractor is the ultimate consumer of sheet metal material, therefore, the tax should be paid by the wholesaler selling to the contractor and of course collected by the wholesaler from the contractor. Mr. Reynolds declared that many contractors are assuming that the purchaser of the equipment is the ultimate consumer and that therefore the contractor should collect a tax and remit the tax to the State Board.

Another confusing ruling refers to the status of the general contractor and subcontractor and the

(*Continued on page* 92)

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RESIDENTIAL AIR CONDITIONING SECTION

IN this issue readers will find the first of several articles presenting the new Technical Code for the Design and Installation of Mechanical Warm Air Heating Systems. Following issues will bring the remainder of the code and typical problems worked out in detail to show how the rules of the code should be applied.

- - - This code is the result of several years of work by the code committee. The code simplifies some existing methods and presents new suggested procedure. The code is sufficiently thorough to cover most domestic winter air conditioning.

- - - The code has been printed in booklet form — price 50 cents — and may be obtained from the office of the NWAH & AC Assn., Columbus, Ohio.

- - - As this issue goes to press, winter is showing definite indications of leaving the northern part of the country. Indications point to the most active and profitable cooling season yet afforded this industry.

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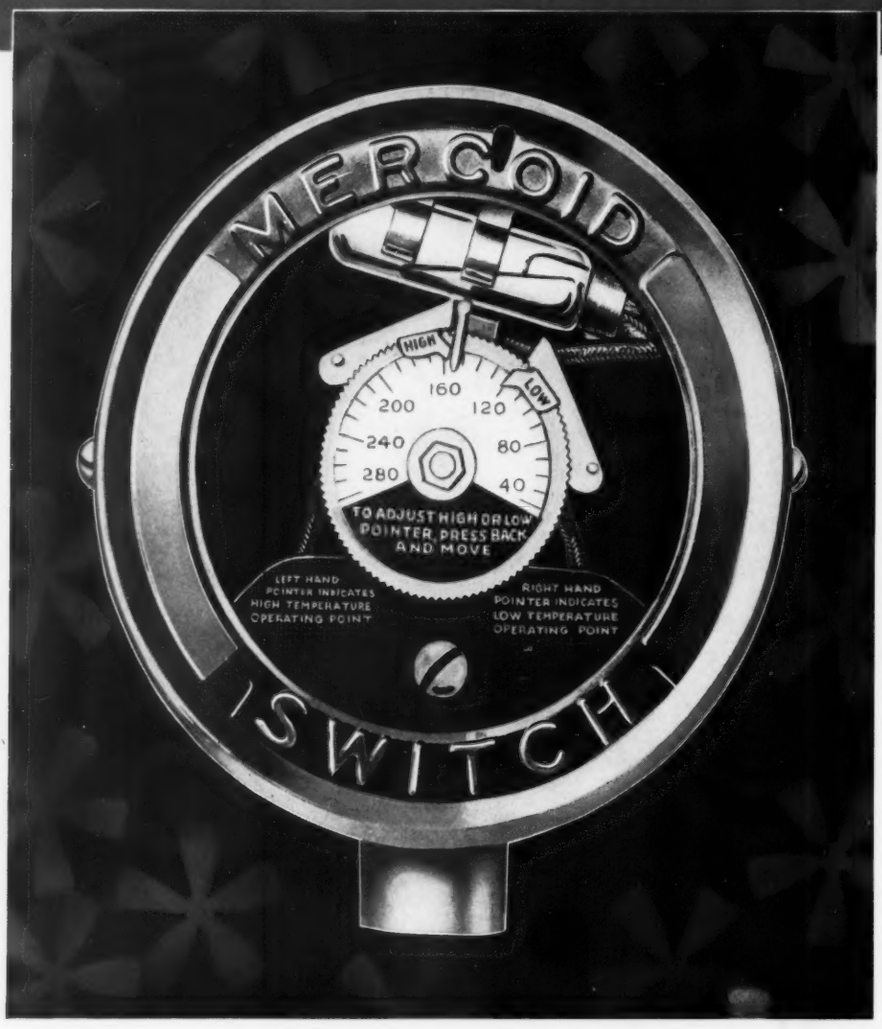

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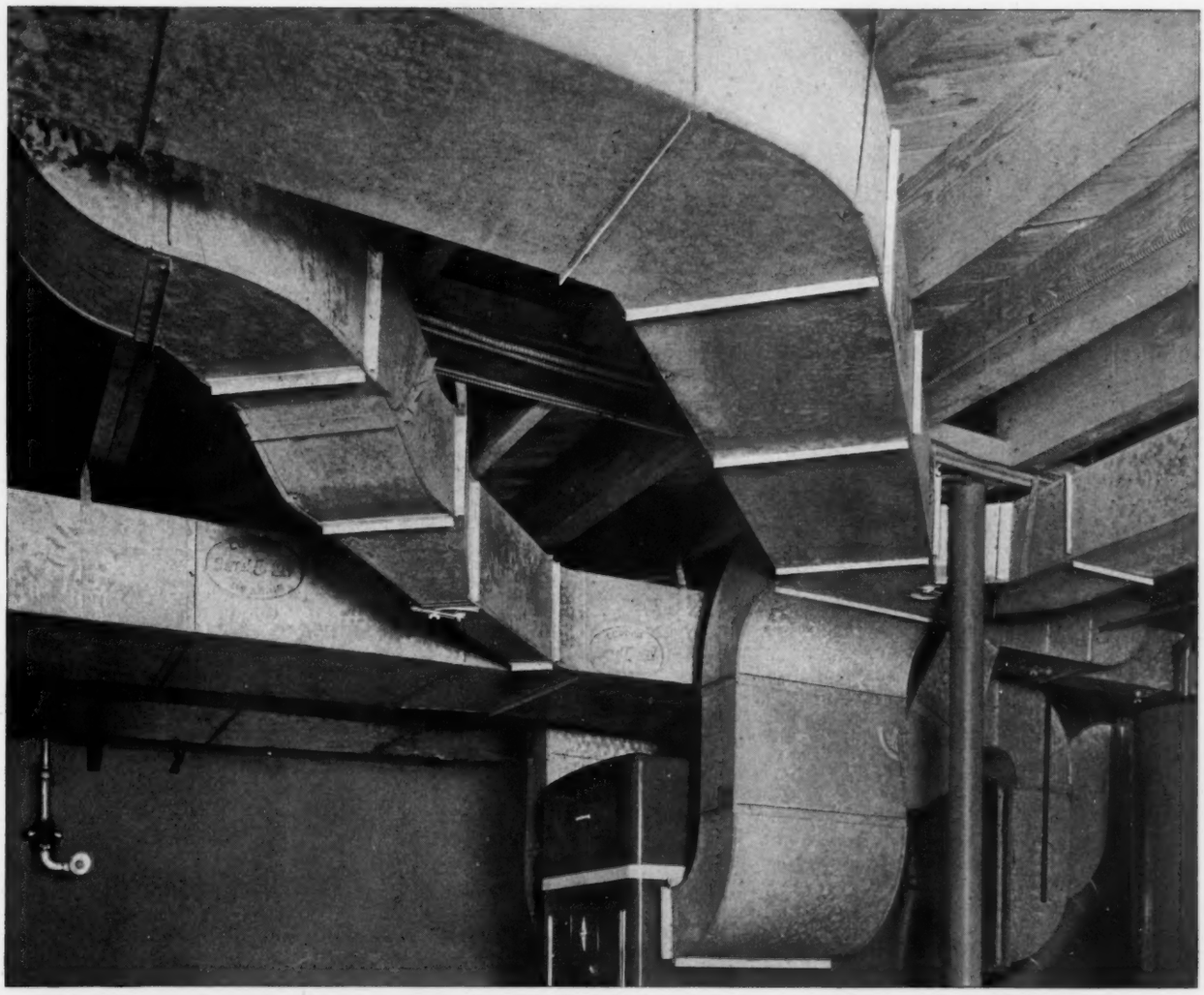

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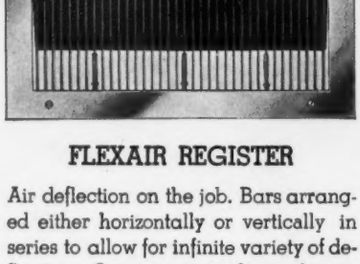

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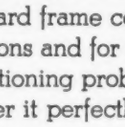

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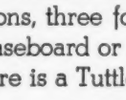

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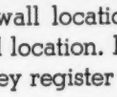

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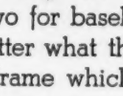

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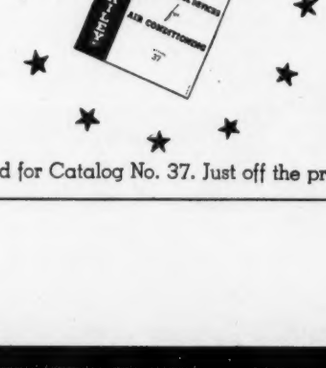

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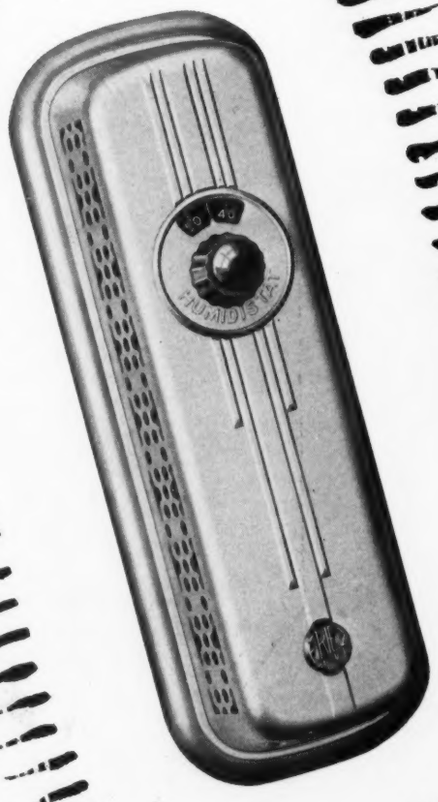

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Promotion
THAT HELPS YOU SELL
The 1937 Delco-Frigidaire advertising and selling drive is the largest and most powerful ever launched in the heating and air conditioning fields. National magazines—Home magazines—Newspapers—Business papers—Architects' papers—Builders' papers—Sales Promotion material and Direct by Mail. Every prospect *in your territory* will be bombarded with the Delco-Frigidaire story *throughout the year*. Here is *Selling Power!* Further proof that *it pays to have the Delco-Frigidaire Franchise*
Keep Cooling Costs
Don't Guess About Cooling Costs!
Frigidaire Controlled-Cost Air Conditioning gives you the facts about all the costs... before you buy
this Summer!
You can Afford
Automatic He
INSTALL Now WHILE COSTS AR
To every Man and Woman who strikes a Furnace:
Here's Automatic Heat you can Afford!
Prices Drop
THE SATURDAY EVENING POST
WILL YOU BE MY
VALENTINE
PRODUCT OF GENERAL MOTORS
DELCO OIL BURNER
FOR OIL OR GAS DELCO

It pays to have this Franchise

DELCO-FRIGIDAIRE

The Air Conditioning Division of General Motors

AUTOMATIC HEATING, COOLING AND CONDITIONING OF AIR

Dealer Plan for 1937

A Franchise Worth Investigating

An organization backed by General Motors... Most complete line of equipment, priced right... Widespread public acceptance ... Greatest advertising and sales promotion in the industry.

Air Conditioning, as "Products of General Motors" develop it, is a year 'round matter—automatic heating and conditioning in winter—automatic cooling and conditioning in summer.

To automatic heating Delco-Frigidaire brings the vast experience of General Motors in building more devices for the combustion of liquid fuels than any other organization.

To automatic cooling Delco-Frigidaire brings the experience of General Motors in developing Freon (the safe, new Cooling Fluid), the Coils, and the Compressors on which all modern air conditioning is based.

Out of this experience comes the present Delco-Frigidaire line of equipment and the *Delco-Frigidaire Franchise*. There are splendid profit possibilities right now in this Franchise. An examination of a few of the products will show this.

A Complete Line of Heating Products

The Delco Oil Burner is the fastest-selling oil burner on the market... the 1936 leader of the industry. And 1937 models offer still more opportunity for its dealers... a line for homes of any size, at drastically lower prices.

The new Delco Automatic Furnaces (Boiler-Burner Units) for steam, vapor, and hot water systems, gas or oil, come in new smaller sizes at lower prices than ever before.

And for warm air systems the Delco gas and oil Conditionairs bring heating PLUS air conditioning to homes of any size.

A new Delco Water Heater for gas or oil rounds out the line of heating equipment, increases the size of your average sale.

A Complete Line for Air Conditioning, too

Cooling? There are more Frigidaire Electric Room Coolers in use than *all other makes combined*, and the new models offer even greater profit possibilities than last year's sensational success.

In the field of air conditioning Delco-Frigidaire again jumps the field with *Controlled-Cost* Air Conditioning . . . a plan for selling air conditioning on a sensible business basis that will appeal to your customers.

Future Possibilities Are Still Greater

Yes, the Delco-Frigidaire Franchise offers marvelous opportunities *today*. But the sound, intelligent business man, the sort of partner whom Delco-Frigidaire wishes to have on the firing line . . . is building for the *future*, too.

To him, Delco-Frigidaire offers a line of products covering the field completely, backed by an organization that has proven its ability to take its dealers to the top.

There's still room for a few business men of this sort in the Delco-Frigidaire picture. Inquiry is cordially invited.

Compare any other Franchise with these

5

DELCO-FRIGIDAIRE ADVANTAGES

1 The power of the name *General Motors* . . . and the proven record of General Motors in taking its dealers to the top.

2 A *complete* line of heating and cooling equipment . . . offering such *proven* sales arguments as the Thin-Mix Fuel Control and "*Controlled-Cost*" Air Conditioning.

3 The right products at prices so competitive that *no sale need be lost.*

4 Accepted national leadership and widespread public acceptance.

5 Dominant and convincing advertising and sales promotion that tells a competitive story—*both* nationally and locally.

Write for more information about this great Franchise

MAIL COUPON TODAY

Delco-Frigidaire Conditioning Division
General Motors Sales Corporation
Dayton, Ohio—Dept. AA-3

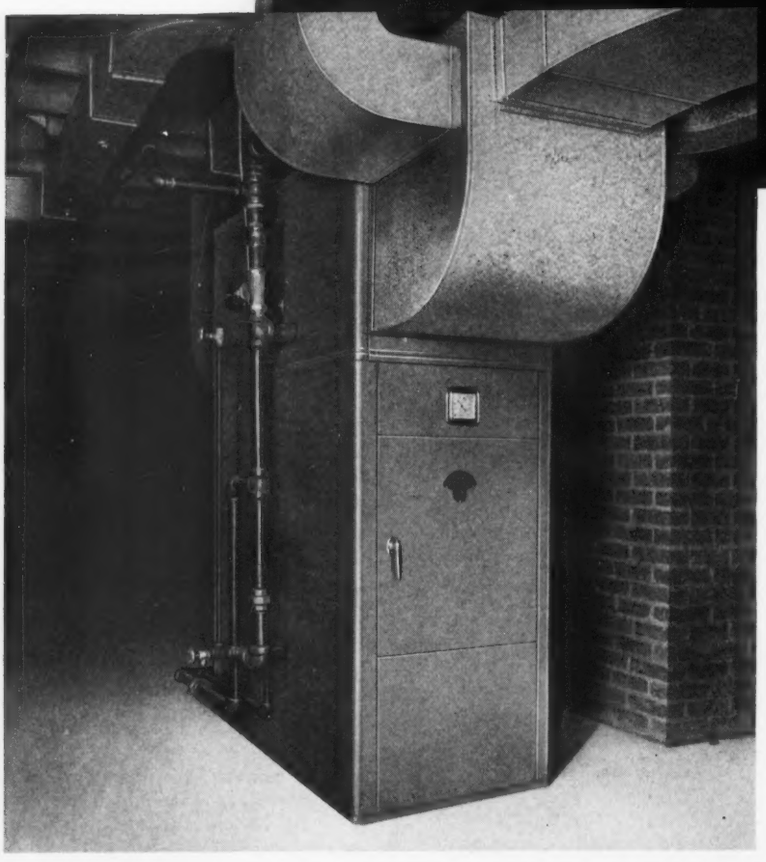
I am interested in your Franchise. Please send me complete information at once.

*Name*_____

*Address*_____

*City and State*_____

"Split-System" Boiler-Air Conditioning *marks the modern home!*



HERE is a beautiful "Split-System" installation of a Fitzgibbons automatic oil-fired Boiler-Air Conditioner. This single unit, with all essentials including the burner, concealed beneath its tastefully colored, heavily insulated steel jacket, supplies *air conditioning* to selected rooms, *steel boiler heat* in bath, kitchen and garage and year-'round *domestic hot water*, all at pleasingly low cost.

●

The FITZGIBBONS
BOILER-AIR CONDITIONER

Cleaned Humidified Tempered Circulated **AIR**

Economical Steel Boiler **HEAT**

Year 'round **HOT WATER** SUPPLY with no storage tank

provides every advantage of modern "Split-System" boiler-air conditioning. It gives that complete separation between the combustion chamber and air ducts which absolutely eliminates any chance of combustion gases leaking into the circulated air. It also removes all "speaking-tube" effect which in old-fashioned systems carried combustion sounds throughout the house.

THIS SINGLE UNIT provides winter *air conditioning* for those rooms in which it is desired, economical *steel boiler heat* for other rooms, and year-'round *tankless domestic hot water* direct from a submerged copper coil. It combines these three valuable home services in an attractive unit that takes up no more floor space than an ordinary heating boiler alone.

The complete story, in the bulletin, should be in the brief case of every heating contractor and dealer. Get this bulletin and the new Fitzgibbons Dealer Franchise. *Write today!*

Fitzgibbons Boiler Company, Inc.

GENERAL OFFICES AND SHOWROOM
ARCHITECTS BLDG., 101 PARK AVE., NEW YORK, N. Y.
Works: OSWEGO, N. Y.
Branches and Representatives in Principal Cities

MINNEAPOLIS-HONEYWELL

ANNOUNCES THE ADDITION OF *National Regulator* AIR OPERATED CONTROL TO THE MODUTROL SYSTEM

WITH its Modutrol System, Minneapolis-Honeywell pioneered electrically operated control for heating, ventilating and Air Conditioning. Now, marking another important forward step, Minneapolis-Honeywell announces that it has entered into an agreement for the acquisition of

NATIONAL REGULATOR CO. OF CHICAGO

with thirty-five years of experience in the pneumatic control field, and are adding to the Modutrol Electric System, the complete National line of Metaphram Compressed Air Operated Controls. Experience has shown that neither air nor electric control is sufficiently universal in its application to be adapted to all control problems. Up to this time no manufacturer has been in a position to offer both types. Now, however, the industry and the collaborating professions have available from one source, a full range of automatic controls and control systems, electrically operated and air operated or a combination of both—a three point service—the right control for each application. Minneapolis-Honeywell Regulator Co., 2726 4th Ave. So., Minneapolis, Minnesota.

A 3 WAY MODUTROL SERVICE . . . . THE RIGHT CONTROL FOR EACH APPLICATION

MINNEAPOLIS-HONEYWELL

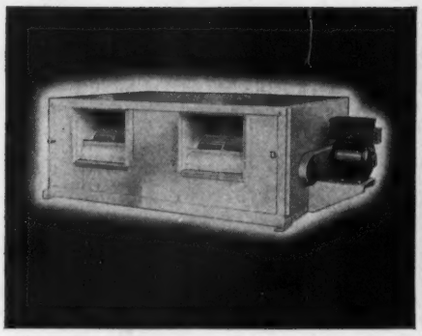
Control Systems

BROWN INSTRUMENTS FOR INDICATING, RECORDING AND CONTROLLING

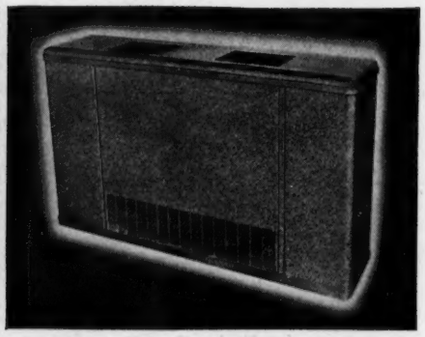
For complete
★★★★★
air conditioning

you need

ALL FIVE PHASES
★★★★★



★ **HUMIDIFYING** air for purity and optimum health or product levels is a major phase of Trane specialization in air conditioning.



★ **DEHUMIDIFYING** equipment has been specified for years by the country's foremost specialists in drying.

New Advertising Campaign by Trane to run in "Time."

TIME March 1, 1937

AN ENGINEER LOOKS AT

Air Conditioning

● This business of weather magic is come of age as the scientific collaboration of several long established and progressive engineering professions: heating—ventilating—cooling—humidifying—dehumidifying—and the automatic control of each operation or combination of operations.

In the evolution of each of these industries, many valuable, but to the public still unknown, mechanical appliances have been brought to a high degree of perfection by the individual companies, and which are now being used in combination to create a "custom-made air conditioning job."

Now almost all applications of air conditioning are necessarily custom-made for several reasons: First, there are as many technical problems as there are conditions in the building to be served due to its existing shape, size, and available equipment already installed. Second, the special requirements of the owners or special requirements of manufacturing processes make additional demands.

In other words, complete air conditioning deals with the directed use of the five professions and the variables of appliances in a confusing number of combinations.

The choice of the most suitable combination, of course, rests with the local architect, consulting engineer and the men whose responsibility it will be to make it work—the contractor.

We are fortunate in this company to have behind us a ripe professional experience both in the laboratory and in the field, in the major individual engineering endeavors that, combined, make air conditioning.

We were privileged to be the creators of a revolutionary heat transfer surface unit indispensable to an air conditioning system. We are the largest manufacturers in the country of non-ferrous convectors, considered to be the successor to the old fashioned radiator. Our work in industrial fields of cooling, humidifying, and dehumidifying with the attendant study of air movement and air cleaning has given us an enviable birdseye view of the engineering problems of application.

Trane coils for heating and cooling have been specified for many years as the standard in those fields by the foremost engineering consultants and by other manufacturers in their finished products.

Consequently, we have had the inestimable advantage of a constant interchange of experiment and experience that today we count priceless. Our own engineering schools in heating, cooling, air circulation, dehumidification, humidification, and air conditioning constantly develop the trained engineering personnel that man our sixty or more offices.

Air conditioning, being a profession, has developed within itself a number of noteworthy, but little known specialists, consulting engineers and engineering corporations, whose work entitles them to special recognition in their fields. To them and the growing number of responsible contractors by whom we are represented, this company owes its more than satisfactory growth and position of responsibility in the industry.

WEATHER MAGIC FOR RESIDENCES, LARGE BUILDINGS, FACTORY BUILDINGS, MANUFACTURING PROCESSES AND PUBLIC CARRIERS

★★★★★ TRANE

THE TRANE COMPANY • LA CROSSE, WISCONSIN

FOR COMPLETE AIR CONDITIONING ★★★★★ YOU NEED ALL

★ HEATING: Trane heating equipment, systems, traps and valves have earned a substantial place in planning any full or partial air conditioning installation.

★ COOLING: Trane Cooling and Direct Expansion Coils are found in thousands of satisfactory installations, ranging the entire gamut of air conditioning application.

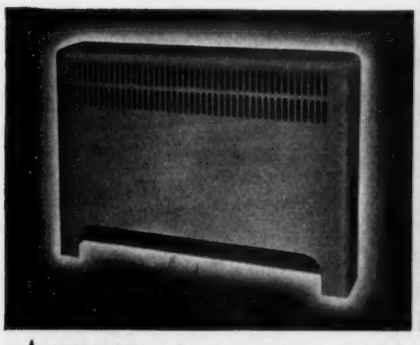
★ VENTILATING: Air tempering for health and comfort has brought Trane Special Ventilating Equipment into contact with every ventilating problem.

★ HUMIDIFYING: Conditioning for health and optimum health or production, of Trane specialization and experience with the other major phases.

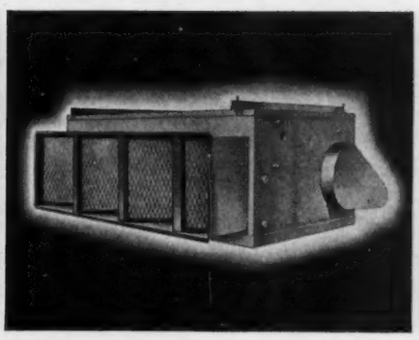
★ DEHUMIDIFYING: Nature's country's foremost specialists in dehumidifying equipment take place in any well designed air conditioning system.

● "Buy full air conditioning whether for residence or factory" is the message for Time's 800,000 property owners. Also emphasized is the need for contractors competent in all five phases of air conditioning. Trane is in a position to help contractors in developing business in every field where business exists. Write today for full information.

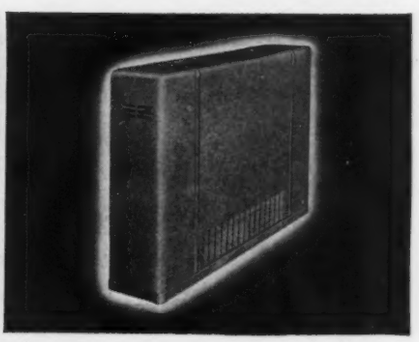
THE TRANE COMPANY
LA CROSSE, WISCONSIN



★ **HEATING** equipment, systems, traps and valves have earned a substantial place in planning any full or partial air conditioning installation.



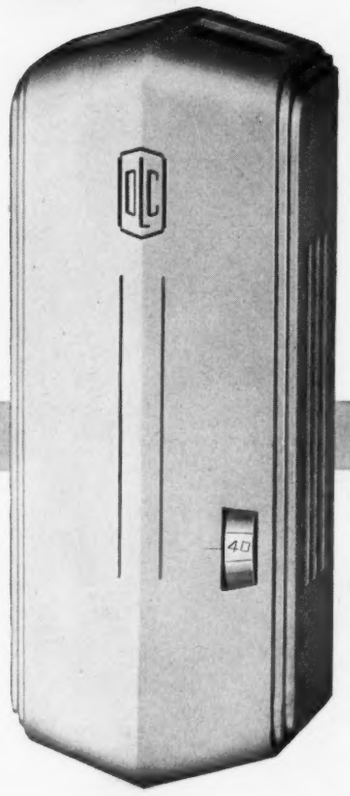
★ **COOLING** and Direct Expansion Coils are found in thousands of satisfactory installations, ranging the entire gamut of air conditioning application.



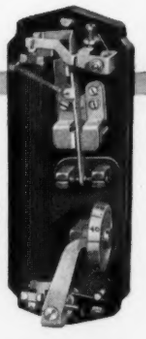
★ **VENTILATING.** Air-tempering for health and comfort has brought Trane special ventilating equipment into contact with every form of ventilating problem.

features

THAT MAKE THIS HUMIDISTAT especially desirable



1. The "Genuine Detroit" Humidistat No. 197 incorporates the patented Friez hair element, which is extremely sensitive, which retains its calibration permanently and which operates under a very close differential.
2. Not vulnerable to the effect of dust accumulation or its resulting lag.
3. Fully operative and accurate up to 100% relative humidity.
4. Attractively styled to harmonize with modern interiors and to match the Two Eleven Thermostat.
5. The one instrument will handle both humidification during the winter and dehumidification throughout the summer if required. Thus dealers' and jobbers' stocks include merely the one unit.
6. Magnetic snap action prevents flutter and the possibility of corrosion at the contacts.
7. A specially designed mounting plate available to carry both the humidistat and the thermostat side by side.



Interior of Humidistat showing the patented Friez multiple hair element.

WRITE FOR BULLETIN 39

Available at leading Air Conditioning and Refrigeration Parts Jobbers

DETROIT LUBRICATOR COMPANY

5900 TRUMBULL AVENUE • DETROIT, MICHIGAN, U. S. A.

NEW YORK, N. Y.—40 West 40th St.
CHICAGO, ILL.—816 S. Michigan Ave.
Canadian Representative — Railway and Engineering Specialties Ltd., Montreal, Toronto, Winnipeg

SUPERFEX *alone* GIVES 24-HOUR AIR CONDITIONING— *not just* 8*

SUPERFEX *alone* TAKES AIR CONDITIONING INTO POPULAR-PRICED HOMES

SUPERFEX No. 100-E (Btu output 65,000 at the register, 72,000 at the bonnet)

Here's what you have been looking for: a compact, single-package unit... a thoroughly proved method of burning oil... a price that lets modern oil burning air conditioning crash through into the huge popular-priced home market!

SUPERFEX No. 100-E is the last word in modern design and engineering. Shipped assembled, it can be carried through any standard door. It is a direct fired heating system giving automatic humidification, and circulated clean, filtered air.

***THE ONLY OIL BURNING AIR CONDITIONING HEATING PLANT THAT GIVES CONTINUOUS (not intermittent) AIR CONDITIONING IN EVERY ROOM**

The "High-Low" burner and the "High-Low" blower make it possible to provide air conditioning in every room —not intermittently, but continuously, 24 hours a day. Only SUPERFEX offers this advantage.

Three Models — Perfection-built SUPERFEX models comprise a complete line offering capacities ranging from 65,000 to 140,000 Btu output at the registers. Built by Perfection Stove Company, the world's leading manufacturers of oil burning home equipment.

SEND FOR COMPLETE INFORMATION

Never before has there been such an opportunity! Now you can sell modern six room homes, air conditioned, complete with plot, for less than $5,000! Send the coupon for complete information. Let us show you how you can figure air conditioning in your next popular-priced job.

The mark of quality

SUPERFEX

Complete automatic oil burning heating plant that conditions air

PERFECTION STOVE COMPANY, 7858-A Platt Ave., Cleveland, O.

Please send complete information about the new SUPERFEX oil burning air conditioning Heating Plants.

Please check:
☐ Architect ☐ Builder ☐ Dealer ☐ Planning new home

Name_____

Street_____

Post Office_____

State_____

TAKE ADVANTAGE OF SURFACE COMBUSTION'S *powerful merchandising program*

TO BUILD BUSINESS IN ALL YOUR MARKETS

● POWERFUL NATIONAL ADVERTISEMENTS in "American Home," "Better Homes and Gardens," "House and Garden," and "House Beautiful," with a combined circulation of 2,715,082, are selling the advantages of Janitrol gas-fired Winter Air Conditioners to thousands of preferred prospects. In addition, monthly advertisements in "Architectural Forum" (circulation 32,238) and in "American Builder" (circulation 62,717) are directed specifically to the new home market.

SELLING THE ADVANTAGES OF GAS HEAT for commercial and industrial establishments, special Janitrol Unit Heater advertisements are appearing throughout 1937 in "Business Week," "Factory Management," "Industrial Equipment News," "Progressive Grocer," in the Administrative Section of "Chain Store Age" (which is included in the Druggists' Edition, Grocery Executives' and Managers' Edition, and the General Merchandising Edition) and in "Heating and Ventilating"... total circulation of all these publications is 271,300.

COMPREHENSIVE DIRECT MAIL CAMPAIGNS are prepared for your use in all sections of your market... on gas heat... on winter air conditioners... on unit heaters... with complete programs for fitting these into your sales activity.

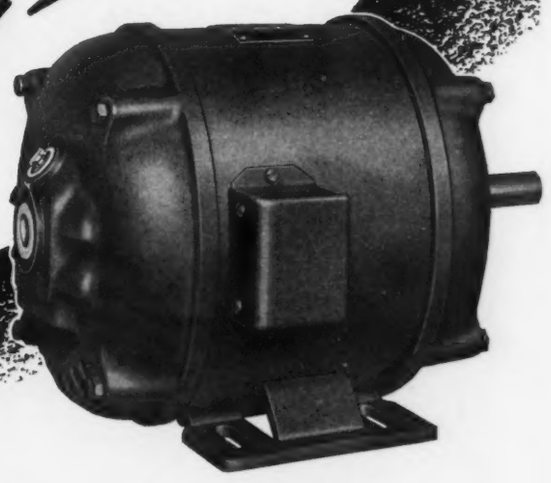
SALES TRAINING MATERIAL includes Market Analysis Charts, Retail Sales Manual, Visual Sales Presentation Manual, Sound Slide Films, Sales Meeting Charts, and Prepared Talks for Training of Retail Salesmen. Sales promotion material includes Leave Pieces, Window Displays, Installation Signs.

If you have not already taken advantage of this broad-gauge plan for building additional profits in the rapidly growing market for gas heat and winter air conditioning, make plans now to tie into this powerful program. Write for details about the complete Janitrol line of gas-fired equipment. Surface Combustion Corporation, 2377 Dorr St., Toledo, Ohio.

JANITROL

WINTER AIR CONDITIONERS
UNIT HEATERS

Increase Sales



Whether it be a Fan, Oil Burner, Pump or Refrigerating Machine, there is available a Century Motor of the size, kind or type that is best adapted to the installation – that is quiet in operation and is remarkably free from vibration.

This enables you to increase sales and profits, because you and your customers can depend on the continuous reliability and satisfaction that Century Motors have delivered for 34 years.

CENTURY ELECTRIC COMPANY

1806 Pine Street • • St. Louis, Mo.

Offices and Stock Points in Principal Cities

Century MOTORS

SIZES UP TO 600 HORSE POWER

ANNOUNCING

THE NEW

WISE

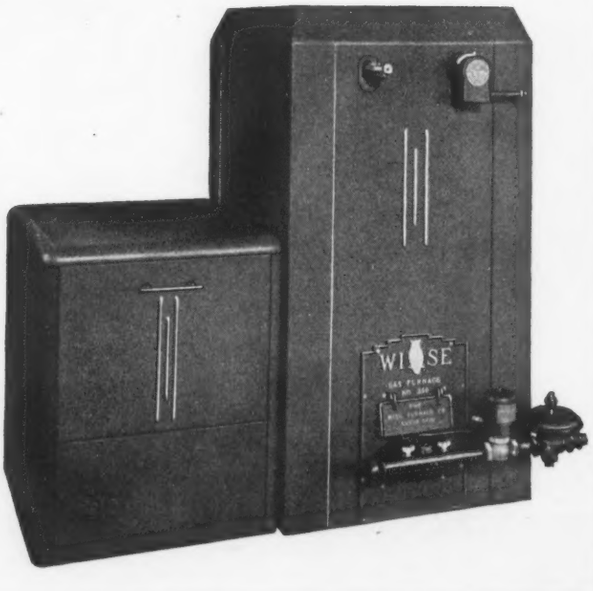
AIR CONDITIONING FURNACES

COAL FIRED

GAS FIRED

CAST IRON

OR STEEL



SEND FOR COMPLETE INFORMATION AND DEALER'S FRANCHISE.

THE WISE FURNACE CO.
AKRON, OHIO

GET BETTER ACQUAINTED WITH *Architects* AND *Builders* —They Influence Many Unit Sales

● Building activity is climbing towards a new peak . . . *new* construction and *re*construction. Specifications are beginning to come out of the offices of architects. A lot of business is on the fire for somebody. Make that "somebody" yourself by getting better acquainted with the men who influence sales. Step out! Shake hands! Sell yourself! Sell heating and air-conditioning equipment! Every unit installed now will be a source of extra profit to you for years to come... if it's equipped with Dust-Stop Replacement-Type Air Filters, as are many leading systems. There's a good, clean profit in clean air if it has been cleaned by Dust-Stop. It has manufacturer acceptance. It is *the nationally advertised air filter.* Your manufacturer will supply you with replacement filters . . . and the coupon will bring you important sales facts. Owens-Illinois Glass Company, Toledo, O.

DUSTOP
REPLACEMENT-TYPE
AIR FILTERS

COUPON

Owens-Illinois Glass Company,
Industrial and Structural Products Division,
301 Madison Ave., Toledo, Ohio.

Please send me, without obligation, facts I ought to know about Dust-Stop Replacement-Type Air Filters.

*Name*_____

*Address*_____

*City*_____ *State*_____

"... a very welcome service ... constructive ... fills a real need ... timely ... helpful in judging developments ... authoritative ... full of vital information ... extremely useful ... a great service ..."

★ ★ ★ **AIR CONDITIONING** ★ ★ ★

Issued From "AIR CONDITIONING HEADQUARTERS"

TRENDS

JANUARY 1937

Keeney Publishing Co., Publishers of "Heating, Piping & Air Conditioning" and "American Artisan" • 6 No. Michigan Ave., Chicago

NEW SERVICE WELL RECEIVED

Pleased were air conditioning sales, advertising, and administrative executives with the first issue of **Air Conditioning Trends,** the new monthly news bulletin devoted to the sales and merchandising aspects of the air conditioning business. Excerpts from a few of their hundreds of letters commenting on the initial number are shown on this page.

A contribution to the better selling and promotion of air conditioning, **Trends** each month will collect and publish 1) reliable facts and figures on the various air conditioning markets, 2) information showing why, when, and how these markets can be sold, and 3) other practical data that will assist those responsible for the SALE of air conditioning to correctly interpret new developments and meet current selling problems.

Each issue will be devoted to a specific subject of current interest to the seller. Thus, the inaugural January number dealt with public utilities and their place in the upbuilding of air conditioning, while the February issue furnishes a comprehensive survey of the hotel market for air conditioning.

WILL HELP DEVELOP NEW BUSINESS

Whenever occasions for so doing present themselves, Trends will lend its assistance in actually developing business in specific markets. Thus its February "Hotel" issue, which contains numerous data proving that hotel guest room and dining room air conditioning is a profitable investment, has been sent to 922 large hotels considered the best immediate prospects for air conditioning.

"I have looked over the first issue of **Air Conditioning Trends.** This I believe, is a very desirable publication to all who are interested commercially in the air conditioning field. . . ."
W. H. Carrier, Chairman of the Board Carrier Corp.

". . . . first issue was of considerable interest. There is a very definite place for a publication of this type in our industry."
A. B. Schallenberg, Alco Valve Co.

"Your first issue of **Trends** . . . . strikes me as a sound, helpful sales bulletin."
T. R. Crawford, Media Dept., M. Glenn Miller, Advertising

". . . . We have already received some helpful suggestions from the bulletin which will assist us in the promotion of air conditioning."
Clem R. Winkler, General Sales Mgr., West Tennessee Power & Light Co.

"I found the first number very interesting . . . am following developments in the air conditioning field with close interest."
Lyman Thompson, N. W. Ayer & Son, Inc.

"I have just seen the first copy . . . and believe you are starting right out to pack it full of vital information."
K. W. Cash, Adv. Mgr., Penn Elec. Switch Co.

". . . Undoubtedly—**Trends** will be a very valuable asset as it develops, and you are to be commended for publishing and distributing such a fine paper."
H. H. Wulf, Sales Eng., In Charge of Comm'l Air Cond., Kelvinator Corp.

". . . **Trends** strikes us as one of the most authoritative and up-to-date references that has come to our attention. . . ."
Robert A. Campbell, Vice-President, Scott Valve Mfg. Co.

". . . . first copy very interesting. We really believe a publication of this kind has a place and fills a real need in the industry due to the point of view from which it is written."
A. C. Watson, Industrial Ins. Sales Fibre Products Div., Corning Glass Works

"I think **Trends** contains very valuable information, and if future issues are as informative and interesting as the first, it will prove of great value to the industry..."
C. K. Lingo, A. C. Engineer, Fla. Power & Light Co.

"Would be very glad to have **Trends** sent to this office . . . material may be helpful in the preparation of our advertising"
C. R. Moffett, Adv. Mgr., Carnegie-Illinois Steel Corp.

". . . This will undoubtedly be of great service to the industry."
L. S. Keilholtz, A. C. Research Engr., Chrysler Corp.

"I was very much interested to receive a copy of the first issue . . . appears to be a very helpful and constructive publication. . . ."
H. L. Fisher, Vice-President, Rickard & Company, Inc.

"We found the first issue of **Trends** very interesting. . . ."
L. J. Galbreath, Prod. Devel. Dept., Revere Copper & Brass, Inc.

". . . there have been so many developments in the air conditioning business that this new publication, I am sure, will be a very welcome service to everyone connected with the problems of air conditioning market. . . . I shall mark this publication for several men in the office who are interested in applications to the air conditioning field."
John J. Curtin, Motor Div., General Electric Co.

". . . This new bulletin can indeed fill a need and if the first issue is any indication then you will not lack material for discussing the current problems on the sales side of air conditioning."
John Grouse, Sales Mgr., Furnace Div., Forest City Foundries Co.

". . . would be glad to have you forward a copy of **Trends** to the properties on the attached list which we operate. We are going into air conditioning this year . . . think your publication will be of considerable help to the managers at our different properties."
W. M. Carleton, Citizens Utilities Co. Minneapolis

". . . more than pleased to receive **Trends** . . . should make interesting reading matter and at the same time can be helpful in judging developments in the field of air conditioning."
E. Szekely, Vice-Pres. & Gen'l Mgr., Bayley Blower Co.

". . . We believe that this publication will be of great service to everyone in the industry and will assist all to pull together instead of shooting out on separate tangents."
O. V. Wooley, Sec.-Treas., Maid-O-Mist, Inc.

A COMPLIMENTARY SERVICE

No commercial venture, but issued with the compliments of the engineering journals, HEATING, PIPING AND AIR CONDITIONING and AMERICAN ARTISAN, **Trends** is distributed to selected sales, advertising, and administrative executives in the air conditioning industry. Those concerned with the **sales side** of air conditioning who wish to receive **Trends** regularly and have not already requested that they be placed on the permanent mailing list, are invited to do so now. Write on your business letterhead to the address below.

KEENEY PUBLISHING COMPANY, 6 N. MICHIGAN AVE., CHICAGO
"AIR CONDITIONING HEADQUARTERS"

AGAIN NORGE LEADS!

NORGE MEETS EVERY HOME HEATING PROBLEM WITH EQUIPMENT THAT HELPS PAY ITS OWN WAY!

NORGE FINE-AIR CONDITIONING FURNACE
Filters, warms, humidifies, and circulates air in every room of the house. Can be adapted easily to full summer air-conditioning as well. Delivers as much as twice the usual amount of heat that old-fashioned furnaces or boilers do from every unit of fuel.

HEATING COSTS CUT AS MUCH AS 50%
Exclusive design of heat transfer unit makes possible a saving of up to 50% in heating costs for the average home now using old-fashioned equipment.

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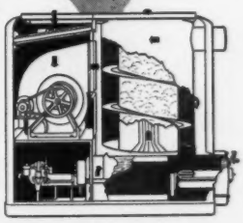

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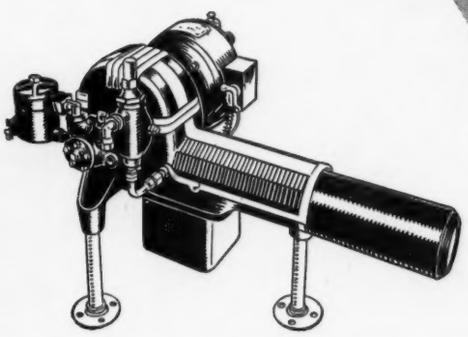

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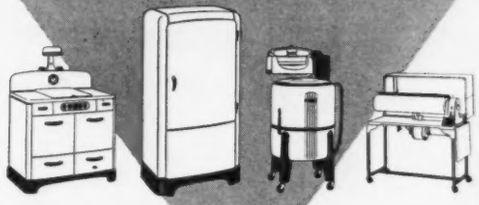

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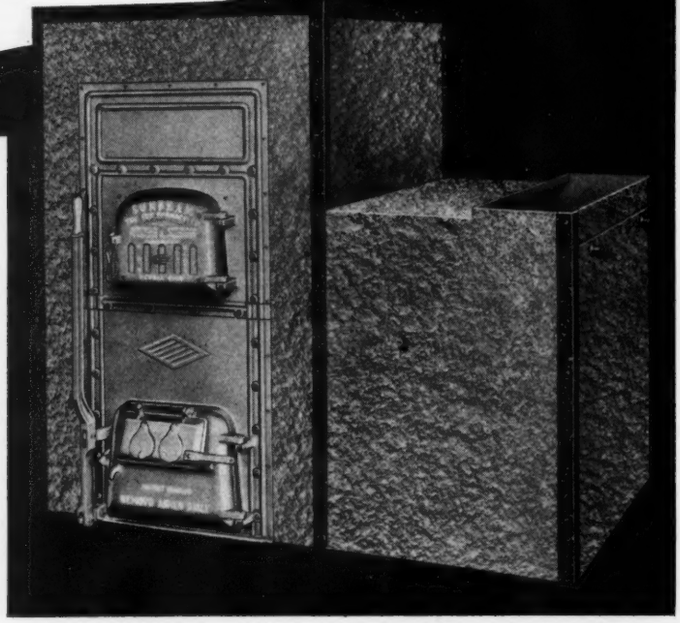

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This new SUNBEAM Air Conditioning Unit is built in both oil and coal burning models. It has the same high quality blower, motor, filter humidifying and control equipment as all other SUNBEAM Air Conditioners. Its square casing is finished in Crystalline Baked Enamel. And it comes to you at an exceptionally LOW PRICE (see price announcement below).

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AA-3-37

Technical Code for The Design and Installation of Mechanical Warm Air Heating Systems

The principal sections of the new code are published in this issue and the next. Lengthy tables, derived from factors in the ASHVE Guide, have been omitted. The full code, consisting of 36 pages, may be obtained from the National Warm Air Heating and Air Conditioning Association, Columbus, Ohio. Price 50 cents.

INTENT OF THE CODE:

This Code is formulated to provide reliable methods of design and installation of mechanical warm air heating systems for the protection of the buying public.

It covers fundamental data and rules which of necessity must be observed. In all cases, however, *experience* is necessary to obtain the full value of its application. *This Code does not attempt to provide the application of all variables found in practice.*

ARTICLE 1

Suggested Field or Scope of Limitations for This Code

Capacity in Btu per hour = 250,000 at the registers.

For larger or unusual systems it is advisable to consult recognized engineering authorities.

Cubic feet of air moved per minute (cfm) = 5500.

Height not exceeding three-story structures.

Temperatures. Inside, as desired, usually 70° F. (min.): outside, See Table 5, page 13. Register air temperatures recommended for design: 110° F. (min.), 150° F. (max.).

ARTICLE 2

Definitions

SECTION 1. *Mechanical warm-air heating systems,* to which this code refers, shall consist of one or more warm air heating units within individual housings or within one common housing, one or more motor driven blowers, smoke or vent pipes, individual leader pipes or trunk line systems, or both, with necessary control dampers for supply and return air, automatic controls, registers, faces and grilles; and with provision for other appurtenances such as filters, air washers, ozonators, humidifiers, etc., as may be desired.

SECTION 2. *An individual supply system* shall consist of separate ducts of round or rectangular cross sections, without branches, and extending from the heating unit. Return ducts may be individual or trunk lines or a combination of both.

SECTION 3. *A trunk line system* consists of one or more main ducts with branches.

ARTICLE 3

Estimating the Heat Loss from Buildings

SECTION 1. This is done by finding the heat loss, H, (in Btu per hour) from each room and then combining all the heat losses for the several rooms into one heat loss, H_b, for the building. The values of H are to be used in estimating the sizes and capacities of the *registers, grilles, stacks,* and *supply* and *return ducts* for the respective rooms; and the value H_b is to be used in estimating the sizes and capacities of the various parts of the combined heating system for the building, composed of *furnaces, blowers, washers, filters,* etc.

In estimating the heat losses for the various rooms, several items necessarily combine to form the value H; i. e., losses by transmission through—(1) exposed glass, (2) exposed wall (including basement wall above grade), (3) partition wall to adjoining rooms of lower temperatures, (4) ceilings to attic spaces, (5) ceilings, part of roof, no attic space, (6) floors to unexcavated or cold spaces below, (7) basement walls below grade to surrounding ground, (8) basement floors to the supporting ground underneath; and (9) by infiltration. These are calculated as follows:

		Equation Number
Glass loss =	Btu per hour = $U_g A_g (t_i - t_o)$	(1)
Exposed wall loss (net area) =	Btu per hour = $U_w A_w (t_i - t_o)$	(2)
Loss through partition walls =	Btu per hour = $U_p A_p (t_i - t_p)$	(3)
Loss through ceilings =	Btu per hour = $U_c A_c (t_c - t_a)$	(4)
Loss through ceilings, part of roofs =	Btu per hour = $U_r A_r (t_c - t_o)$	(5)
Loss through floors above unexcavated spaces or to cold rooms below =	Btu per hour = $U_f A_f (t_f - t_a)$	(6)
Loss through basement walls below grade to surrounding ground =	Btu per hour = $U_x A_x (t_i - t_g)$	(7)
Loss through basement floors on ground =	Btu per hour = $U_y A_y (t_f - t_g)$	(8)
Infiltration loss =	Btu per hour = $0.018 CL (t_i - t_o)$	(9)
Outside air to replace vented air =	Btu per hour = 0.018 (cfm) $60 (t_i - t_o)$..	(10)

H (for each room) = heat loss as given by the sum of the results obtained from equations (1) to (10)..... (11)

H_b = total H values obtained for the building..... (12)

SECTION 2

Explanation of Terms in Equations (1) to (10)

Equation (1) U_g = unit rate of heat transmission through the glass; A_g = area of exposed glass surface in square feet; t_i = inside design air temperature; t_o = outside design air temperature as per Table 5.

Equation (2) U_w = unit rate of heat transmission through the exposed wall; A_w = area of net exposed wall surface in square feet; t_i = inside design air temperature; t_o = outside design air temperature as per Table 5.

Equation (3) U_p = unit rate of heat transmission through the partition; A_p = area of the partition surface in square feet; t_i = inside design air temperature; t_p = air temperature in cold room or enclosed space. See Table 1.

Equation (4) U_c = unit rate of heat transmission through the ceiling construction; A_c = area of ceiling surface in square feet; t_c = temperature of the room air at ceiling (usually 1° per foot above the breathing level, in residences); t_a = air temperature in attic or space above ceiling. See Table 1.

Equation (5) U_r = Unit rate of heat transmission through the roof to the outside air; A_r = area of roof surface in square feet; t_c = temperature of the indoor air near the roof; t_o = outside design air temperature as per Table 5.

Equation (6) U_f = unit rate of heat transmission through the floor to the unheated space; A_f = area of floor surface in square feet; t_f = temperature of the air at the floor level (usually 5° below room design air temperature); t_s = air temperature within the unheated space. Temperatures of unoccupied spaces below first floor, with tight floor and wall, usually taken as an average between inside and outside design air temperatures.

Equation (7) U_x = unit rate of heat transmission through the basement wall below grade to surrounding ground; A_x = area of basement wall surface below the grade line in square feet; t_i = design air temperature of the basement room; t_g = assumed average temperature of the surrounding ground (may be taken as 25° in zero weather).

Equation (8) U_y = unit rate of heat transmission through the floor to the ground; A_y = area of floor surface in square feet; t_f = temperature of the room air at the floor; t_g = assumed temperature of ground below the floor (may be taken 20° below room design air temperature).

Equation (9) C = air leakage, Table 4, in cubic feet per lineal foot of crack per hour at 15 m.p.h. wind velocity. L = length of exposed crack in feet. $0.018 = 0.24 \times 0.075$. In a room with one exposed wall use the total length of crack. In a room with two exposed walls use the side having the greatest length of crack. In a room with three or more exposed walls take the wall having the greatest length of crack, but in no case take less than one-half the total crack. t_i = inside design air temperature; t_o = outside design air temperature as per Table 5.

Equation (10) See Art. 6, Section 2, Item (a), 7th par.

SECTION 3

TABLE 1

U_c or U_p	t_a or t_p When Out-of-Door Temperature is 0°	—10°	—20°
.6 Btu per hour	35	30	26
.5 Btu per hour	32	27	23
.4 Btu per hour	28	24	20
.3 Btu per hour	23	20	17
.2 Btu per hour	18	16	14
.1 Btu per hour	10	9	8

NOTE: The temperature t_a or t_p on the unheated side of a ceiling or a partition next to an unfinished attic space varies with the construction. Under ordinary conditions it can be assumed: when the rates of heat transmission (U_p) or (U_c) are as in Table 1, the corresponding cool side air temperatures (t_a) or (t_p) will prevail.

SECTION 4

TABLE 2**

Recommended Conductivities and Conductances for Computing Heat Transmission Coefficients

Conductivities (k) are expressed in Btu per hour per square foot of surface per degree difference (Fahrenheit) per inch thickness; $\frac{1}{k}$ is *resistivity* on the same basis. *Conductances* (C) are indicated by asterisks (*) and are for thickness or condition stated, *not* per inch; $\frac{1}{C}$ is *resistance* on the same basis.

TABLE 3**

Heat Transmission Coefficients for Average Building Constructions

SECTION 5. The heat *transmission coefficients* given below represent the unit rate of heat transmission or Btu heat loss per square foot of surface per hour per degree difference between the temperatures on the heated and the unheated sides of the surface.

Outside walls and roofs are based on 15 mile per hour wind.

TABLE 4

Infiltration**

SECTION 6. Expressed in cubic feet per foot of crack per hour.

Method of Calculating (U)

SECTION 8. For types of construction not given in Table 3, the value of (U) may be obtained from Equation 13.

$$U = \frac{1}{\frac{1}{f_i} + \frac{x_1}{k_1} + \frac{x_2}{k_2} + \ldots + \frac{1}{A} + \ldots + \frac{x_3}{k_3} + \frac{1}{f_o}} \quad \ldots\ldots(13)$$

Where f_i = inside surface conductance (1.65 for still air); f_o = outside surface conductance (6.00 for a wind velocity of 15 m.p.h.); x_1, x_2, x_3, etc. = materials thickness; k_1, k_2, k_3, etc. = thermal conductivities in Btu per square foot of surface per hour per one-inch thickness and one degree Fahrenheit temperature difference between the two surfaces, see Table 2; A = thermal conductance of an air space in Btu per square foot of surface per hour for a temperature difference of one degree Fahrenheit, usually taken 1.10. When the thermal conductance C for the thickness as used is given instead of the conductivity k per inch, $\frac{1}{C}$ should be used instead of $\frac{x}{k}$ in the formula.

Application 1. Given an 8-in. brick wall (4-in. face brick, k_1, = 9.20, and 4-in. common brick, k_2 = 5.00) Table 2, find (U).

$$U = \frac{1}{\frac{1}{1.65} + \frac{4}{5.00} + \frac{4}{9.20} + \frac{1}{6.00}} = 0.50.$$

See Item 3 (a), Table 3.

Application 2. Given a standard frame wall (lath and plaster, stud, space, sheathing, building paper and lap siding) find (U).

$$U = \frac{1}{\frac{1}{1.65} + \frac{1}{2.5} + \frac{1}{1.10} + \frac{1}{.50} + \frac{1}{6.00}} = 0.25.$$

See Item 1 (a), Table 3.

Application 3. Given same wall as application 2, with the stud space filled with rock wool bat, find (U).

$$U = \frac{1}{\frac{1}{1.65} + \frac{1}{2.5} + \frac{3.6}{.27} + \frac{1}{.50} + \frac{1}{6.00}} = 0.061.$$

See Item 1 (d), Table 3.

Application 4. Given an 8-in. concrete block wall, below grade, find (U).

$$U = \frac{1}{\frac{1}{1} + \frac{1}{1.65}} = .62.$$ See Item 10 (e), Table 3.

**(Coefficients are from the 1936 A. S. H. & V. E. Guide.)
**(Extract from Table 2, page 135, The Guide, 1936.)

ARTICLE 4

Selection of the Furnace

SECTION 1. The furnace shall be selected to satisfy the Btu requirement, H_b, of building.

The furnace used for burning solid fuels shall be rated according to the following equation:

$$\text{Btu at register} = .85\ (G \times E \times F \times C)\ [1+0.02\ (R-20] \quad \ldots (14)$$

Where G = grate area in square feet; E = efficiency of the furnace at the bonnet, (.65); F = calorific value of the fuel (unless otherwise specified, manufacturers generally use 12000 Btu for catalog ratings); C = combustion rate; i. e., pounds of fuel burned per hour per square foot of grate (7.5), with a minimum draft at the smoke pipe connection to the furnace of not less than .12 inches of water; and R = ratio of heating surface area to grate area.

For furnaces designed to burn fuel oil or gas, use manufacturers ratings. In no case shall the input exceed the furnace manufacturers' specifications. It is not advisable to use more than 75 per cent bonnet efficiency in sizing equipment.

When furnaces are stoker fired use a combustion rate of not to exceed 10 pounds per square foot of equivalent grate area per hour for normal operation, and 65 per cent efficiency at the bonnet for 12000 Btu coal.

For highest efficiencies, when using blowers, baffling is recommended.

ARTICLE 5

Register Air Temperature to Be Used in Design

SECTION 1. To find the total cfm for the rooms to be heated multiply the total cubic contents of rooms by the number of air changes selected and divide by 60. The total building cfm *requirements* shall be equal to, or greater than, five complete air changes through the system per hour, dependent upon the resultant register air temperature (See Section 2). To determine the average register temperature, divide the total building cfm by H_b for cfm factor and refer to Fig. 1. Systems installed in old houses utilizing old stacks are exceptions.

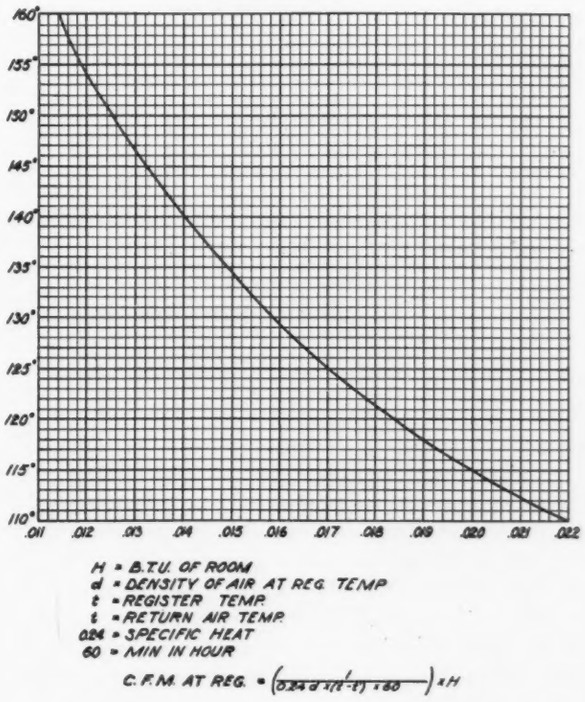
SECTION 2. Figure 1 is charted by use of the following equation:

$$\text{cfm at Register} = \left(\frac{1}{0.24d \times (t-t') \times 60}\right) H \times \quad \ldots (15)$$

H = Btu of room; d = density or weight of entering air at register in pounds per cubic foot; t = temperature of entering air (register temperature); t' = temperature of air leaving room (return air temperature); 0.24 = specific heat of air, or Btu required to raise one pound of dry air one degree F; 60 = min. per hr.

For the usual range of entering air temperatures the terms

Figure 1
C.F.M. Factors



written in the bracket in Equation (15) may be reduced to a single factor and equation (16) may be written:

$$\text{cfm} = \text{Factor} \times H \quad \ldots (16)$$

These factors, corresponding to the various register air temperatures and based on 65° Return Air temperature, as given in Figure 1, offer a simple and reliable method for obtaining the cfm for each room.

Example—Suppose the register air temperature is 135° F, then from Figure 1 the factor is 0.0149. If the heat loss (H) is 15000 Btu per hour, then the volume of air flowing to the room in cfm = 0.0149 × 15000 = 224.

It is common practice to proportion the return ducts upon the same volume basis as the supply ducts.

SECTION 3. cfm requirement per room.

Due to the fact that the drop in temperature between the bonnet and the register is dependent upon the actual length of the run, it is necessary to compute the bonnet temperature (See Art. 6, Sec. 2, Item d) and establish the register temperature for each run (See Art. 6, Sec. 2, Item e). Multiply the Btu load of each run by the factor corresponding to the register temperature, as shown in Figure 1.

Bureau for Inventors

The poor inventor, frequently pictured as one who seldom reaps the material rewards of his ideas, is now to be aided on his path to success by the newly opened American Bureau of Invention, which has its headquarters in the General Motors building, New York City.

The bureau, whose director and moving spirit is Ray Gross, engineer and author of books and articles on inventions and inventors, has as its purpose "shortening the lag now existing between the conception of an idea and its commercial fruition." A permanent exhibition is planned for inventions, apparatus, materials and graphic presentations of facts and information for the benefit of manufacturers and others.

Practical help to the inventor in every step from the conception of an idea to the merchandising of the finished product will be rendered by the bureau through a board of technicians, which will pass on the soundness of the idea from the engineering standpoint, a board consisting of manufacturers and merchandise experts to pass on the commercial value of the idea, and a legal division which will safeguard the interests of all parties involved.

"Through the bureau, the inventor will quickly have an index to the technical and commercial value of his idea," says the bureau's statement. If the boards see possibilities in an idea, the bureau will undertake to find a logical investor or manufacturer capable of developing it. Expenses of patents, models and experimental development work are to be advanced by the prospective purchaser against a percentage of the royalties or purchase price agreed to by both parties."

Factors Affecting Fuel Saving*

By S. Konzo
Special Research Associate
Engineering Experiment Station
University of Illinois

Fuel Savings Effected by Differences in Plant Installation

Conversion Gas and Oil Burning Furnaces

WHEN a furnace or boiler, which is designed for burning solid fuel, is converted to a unit for burning gaseous fuel, the thermal efficiency obtainable with the conversion unit may be almost as high as that obtainable with a furnace or boiler especially designed for gas combustion. This was demonstrated by the tests made by Professor R. B. Leckie‡ at Purdue University. Therefore, in the case of gaseous fuel very little gain in fuel economy is to be expected by replacing a properly-installed conversion unit with a unit specially designed for burning gas.

On the other hand, in the case of oil conversion units decided differences in fuel economy were obtained when a conversion unit was replaced in the Research Residence with a furnace especially designed for oil combustion. One series of tests was run with a gun type oil burner placed in a cast-iron, circular radiator type furnace having a total heating surface of approximately 60.3 sq. ft. The tests were made with the burner adjusted to burn oil at a rate of 13.0 lb. per hr., with the air inlet to the burner adjusted to maintain 9.5 per cent CO_2 in the flue gases, and with the circulating fan in the forced-air system adjusted to deliver approximately 1,675 cu. ft. per minute. The second series of tests was run with the same oil burner placed in a steel furnace designed for oil combustion, having a total heating surface of approximately 102 sq. ft. The tests were made under identical conditions of operation, and data were secured over a wide range of outdoor weather conditions. The data on the amount of fuel required to operate the Research Residence with the two units are shown in Fig. 3 in which the daily fuel consumption, in pounds of oil, is plotted against the difference in temperature between the indoors and outdoors. The curves show that the average daily amount of fuel required to heat the Residence when the outdoor temperature was 40 deg. F., which corresponds closely to the mean seasonal temperature in Urbana, Illinois, was 82.5 lb. when the conversion unit was in use, and 73.0 lb. when the designed unit was in use. This represents a difference in fuel consumption of 11.5 per cent attributable to the difference in furnace design and construction.

*Paper presented at the First Annual Conference on Air Conditioning, held at University of Illinois, May 4 and 5, 1366.

‡See Purdue University Engineering Bulletin Research Series No 36. "Tests of Gas Home-Heating Equipment" by R. B. Leckie and C. H. B. Hotchkiss, Vol. XV, No. 3, May 1931, also Research Series No. 48, "Investigation of the Use of Gaseous Fuel in Warm-Air Furnaces" by R. B. Leckie, Vol. XVIII, No. 6, November 1934.

In this connection similar data are desirable on the relative fuel consumption of a hand-fired coal furnace and the same furnace equipped with a mechanical coal stoker. It should be noted that the difference between the cost of heating a house with the use of a mechanical stoker and that of heating it with the use of a hand-fired coal plant is attributable not so much to the increase in thermal efficiency of the furnace or boiler as to the decrease in unit cost of the coal. In fact, any cost comparisons between hand-fired and stoker-fired coal plants are subject to extremely wide variations depending upon the cost of the fuel used as a basis of comparison. The use of a stoker will have the additional advantages of convenience, smokeless combustion of high-volatile coals, and more uniform residence temperatures.

Design Characteristics of Furnaces

Tests made in the Laboratory Plant at the University of Illinois* on four different types of warm-air furnaces indicated the importance of heating surface as

*"Investigation of Warm-Air Furnaces and Heating Systems, Part III," Univ. of Ill. Eng. Exp. Sta. Bul. 188, pp. 38-44.

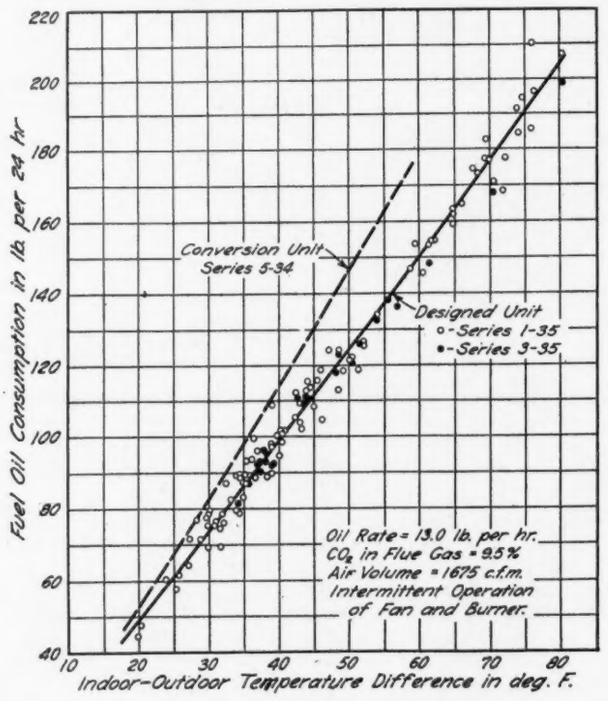


Fig. 3—Fuel Consumption Curves for Two Oil Furnaces

a factor in determining the capacity of a furnace under conditions of equal combustion rate. The curves in Fig. 4 indicate that the relation between the ratio of heating surface to grate surface and unit capacity, for the types of furnaces tested, and over the range of ratios of heating surface to grate surface included by the

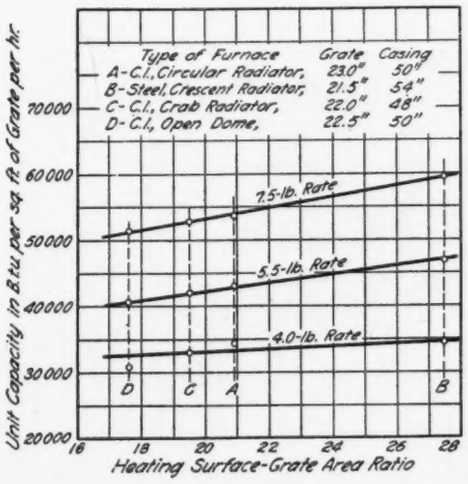


Fig. 4—Effect of Heating Surface Area on Unit Capacity

furnaces tested, can best be represented by straight lines, particularly at medium and high combustion rates. If a combustion rate of 7.5-lb. is regarded as typical, and a ratio of heating surface to grate surface of 20 to 1 is taken as a base, the slope of the line is such that an increase of approximately 2 per cent occurs in the capacity per sq. ft. of grate surface per hour for each unit of increase in the ratio of heating surface to grate surface. Under normal operating conditions in a residence a slight increase in the capacity would not be reflected in a corresponding increase in fuel saving. However, the results do indicate that, from the standpoint of thermal efficiency, the material used in the construction of the furnace is relatively unimportant, whereas, the relative amount of heating surface per unit area of grate is of some significance.

Fuel Savings Effected by Differences in Plant Operation

The amount of heat wasted from the chimney in any heating installation is an irretrievable loss. This loss may be accounted for in the unburned combustibles, in both solid and gaseous form, that result from incomplete combustion, in the uncondensed moisture in the flue gas, and in the sensible heat remaining in the hot gases.

The unburned combustibles in the flue gas may be composed of solids in the form of carbon or higher hydro-carbons, and gases in the form of carbon monoxide, hydrogen or hydro-carbons. Material improvement particularly in hand-fired coal plants, may be effected by proper firing methods, which minimize the formation of free hydrogen and carbon monoxide. The loss represented by carbon in the smoke may be small, but it may indicate the presence of CO and hydrogen.

Even under conditions of complete combustion, however, a substantial amount of heat is lost through the chimney, the magnitude of which is dependent on the temperature and composition of the flue gas. In the case of oil combustion, for instance, these stack losses can be computed for a given flue gas temperature and for a given percentage of CO_2 existing in the flue gas. Fig. 5* shows typical stack-loss curves applicable to combustion of domestic oil-burner distillates. Similar curves can be derived for gaseous or solid fuels when the chemical constituency of the fuels is known.

It may be noted in Fig. 5 that, for a given percentage of CO_2 in the flue gases, the stack-losses increase as the temperature of the flue gases increase. An oil-burning furnace having a large amount of heating surface will abstract a greater amount of heat from the hot gases, resulting in a lower flue gas temperature, than a furnace having a smaller amount of heating surface. The stack losses for the furnace having the large amount of heating surface will therefore be less than those for the furnace having the smaller amount of heating surface. This was found to be the case in the tests made in the Research Residence which were discussed in the opening paragraphs.

Also, for a given oil-burning furnace, operated to maintain a given percentage of CO_2 in the flue gas, the flue gas temperature will be directly dependent upon the rate of oil input to the furnace. As a result, as indicated by the curves in Fig. 6, the thermal efficiency of the furnace tends to decrease as the rate of oil combustion is increased.

It may also be observed from Fig. 5 that, for a given flue gas temperature, the stack losses will be diminished if the percentage of CO_2 in the flue gases is increased.

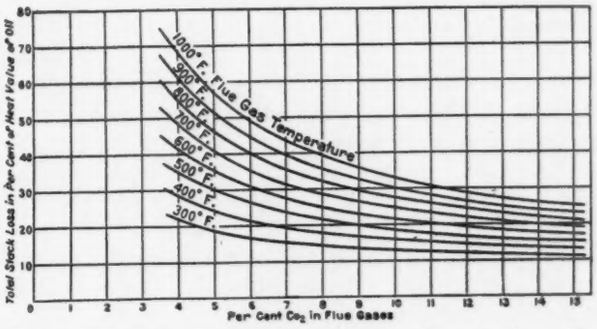


Fig. 5—Stack Loss Curves for Combustion of Domestic Oil-Burner Distillates
(From Technical Bulletin No. 109, U. S. Department of Agriculture)

In the case of oil combustion the air adjustment on the burner should be set to provide for the minimum amount of excess air that will not be accompanied by the presence of CO, smoke, or other operating difficulties. It may be noted that if the flue gas temperatures can be maintained at a value less than 500 deg. F. there is not much to be gained by attempting to increase the CO_2 composition in the flue gas beyond approximately 10 per cent.

Soot Formation on Heating Surfaces

The accumulation of soot on the heating surfaces of a boiler or furnace tends to decrease the heat transmission from the hot flue gases to the circulating me-

(*Continued on page* 94)

*Curves reproduced from U. S. Dept. of Agriculture Bulletin No. 109, "A Study of the Oil Burner as Applied to Domestic Heating" by Arthur H. Senner, July, 1929, Page 71, Fig. 33.

Pattern Development for Air Conditioning Fittings*

This article is the second of a series which will cover practical methods for developing and cutting the patterns for fittings and typical sections used in small ventilating, residential air conditioning and forced air heating systems. In order to make the series a usable manual, the editors invite requests for special fittings to be transmitted to the author.

By William Neubecker
Head Instructor,
Sheet Metal Department, New York Trade School

THIS article will discuss patterns for curved elbows. Fig. 5 shows how curved elbows are designed regardless of what degree of curvature they may have. This method is applicable to either square or rectangular ducts. The patterns shown are developed for Pittsburgh lock and drive cleat which is the usual method of construction. If the corners of the elbow are to be double seamed, the heel and throat patterns will be different from those shown in Fig. 5 as will be explained as we proceed.

Draw any right angles as *C-E-B.*. Using *E* as a center with the desired throat radius, draw the quadrant *A-D* (whether a wideside or a narrowside elbow is required) set off the desired width as shown from *A* to *B* and complete the quadrant *B-C*. *A-B-C-D* is, then, a 90-degree curved elbow.

Divide the curve *B-C* in 3 parts or 30 degrees each as *F* and *G*, from which draw radial lines to the center *E*. Then *G-H-D-C* is a 60 degree elbow and *F-J-D-C* a 30-degree elbow. Divide the curve *B-C* into 2 parts and obtain *K* from which draw a line to *E*. Then *K-L-D-C* will represent a 45 degree elbow. In this manner any angle can be obtained.

Assuming that the elbow is to be constructed with Pittsburgh lock and drive cleats, the heel and throat patterns are laid out as follows. Take the girth of the heel *B-C* and set it off on any line as *b-c* at the right. From *b* erect the line *b-e* equal to the depth of the elbow including the Pittsburgh locks as shown from *b* to *e* and complete the rectangle *b-c-d-e*. Now take the girth of the throat *A-D* and set it off in the pattern from *b* to *h* and erect the perpendicular line *h-i*, then *i-e-b-h* is the desired pattern. Add locks as *o o* on both ends of the patterns. Also to the ends *A-B* and *C-D* in side view.

The heavy shaded section lines in both diagrams indicate how the bends are made in the brake. If "S" slips are used in joining the elbow to the duct, a slip connection must be added along *A-B* and *C-D* as indicated by *t-t* above *A-B*. Care must be taken to draw *A-t* and *B-t* always at *right angles* to the line *A-B*. This slip connection necessitates adding the distance *B-t* to the both ends of the heel and throat patterns along *o o*.

If the corners of the elbow are double seamed the heel and throat patterns will be bent as indicated in the dotted and shaded section from *M* to *N* and the corners will be constructed as shown in diagram *O* where *l* is turned down over the "dolly" or stake to make the finished seam at *M*.

Curved Transition Elbows

In Fig. 6 is shown a side and front view of a 90-degree, curved, transition elbow rectangular to rectangular. In designing elbows of this type, graceful, frictionless curves must be drawn as follows:

Draw the right angle *1-C-7* in side view. With the desired throat radius, using *C* as a center describe the quarter circle *8-13*. Set off the depth of the rectangle *8* to *7* and the width *13* to *1*. Now take the distance *C* to *7* and *always* set it off from *1* to *B*.

Use *B* as center, with *B-7* as radius, draw the quarter circle *1-6* to intersect the vertical line drawn from *B*, at *D*. From *D* draw a line to *7*. This gives a gradual, graceful, frictionless curve from the wide side *1-13* at the top, to the narrow side *8-7* at the bottom. Note that the sections of the rectangles at both ends are similar in size but are placed in a reversed position as shown by *A*, *A°* and partly by *A°°*.

A simplified method will be shown in laying out the heel and throat patterns so that the elbow can be con-

(*Continued on page* 82)

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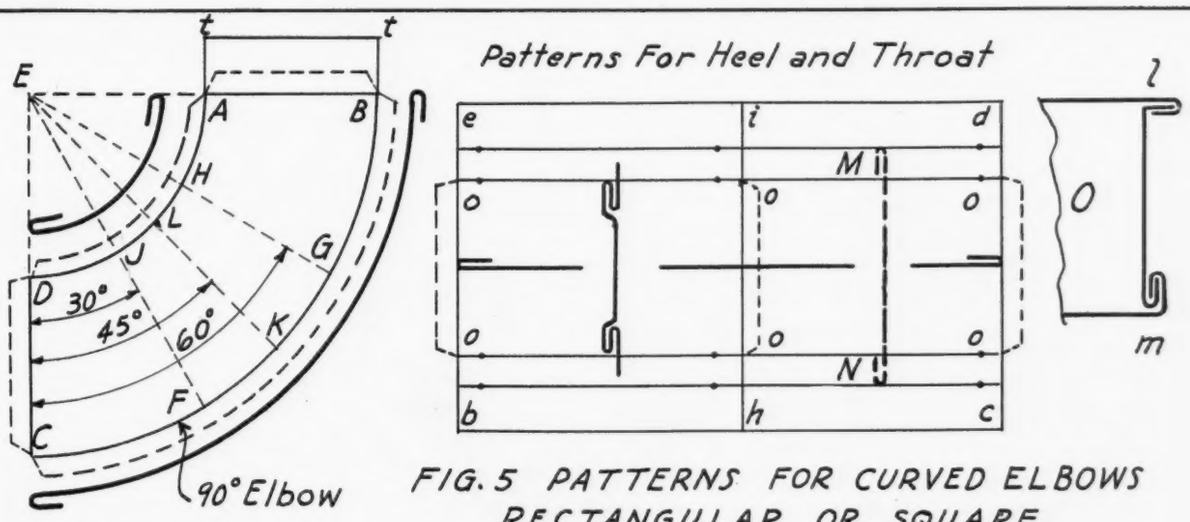


FIG. 5 PATTERNS FOR CURVED ELBOWS RECTANGULAR OR SQUARE

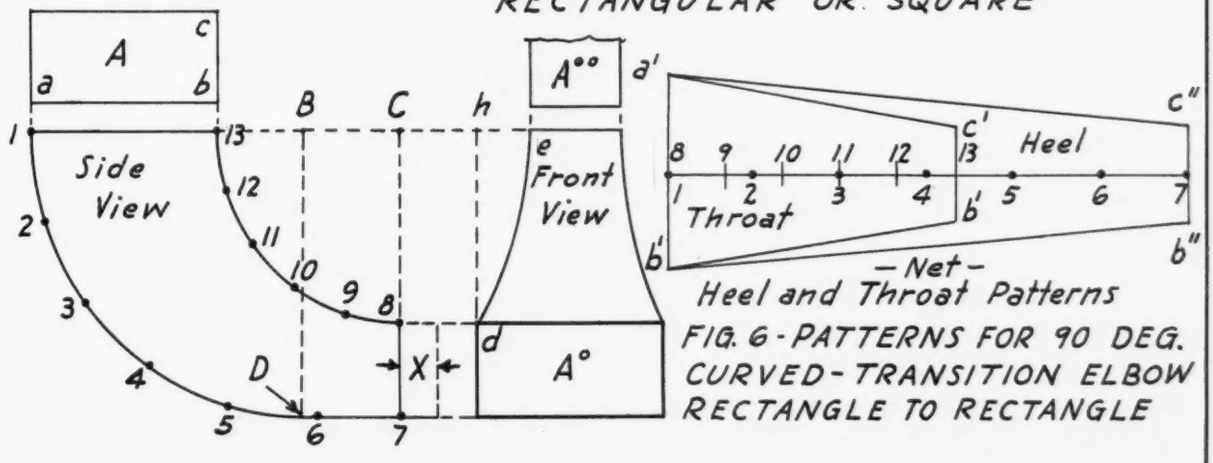


FIG. 6 - PATTERNS FOR 90 DEG. CURVED - TRANSITION ELBOW RECTANGLE TO RECTANGLE

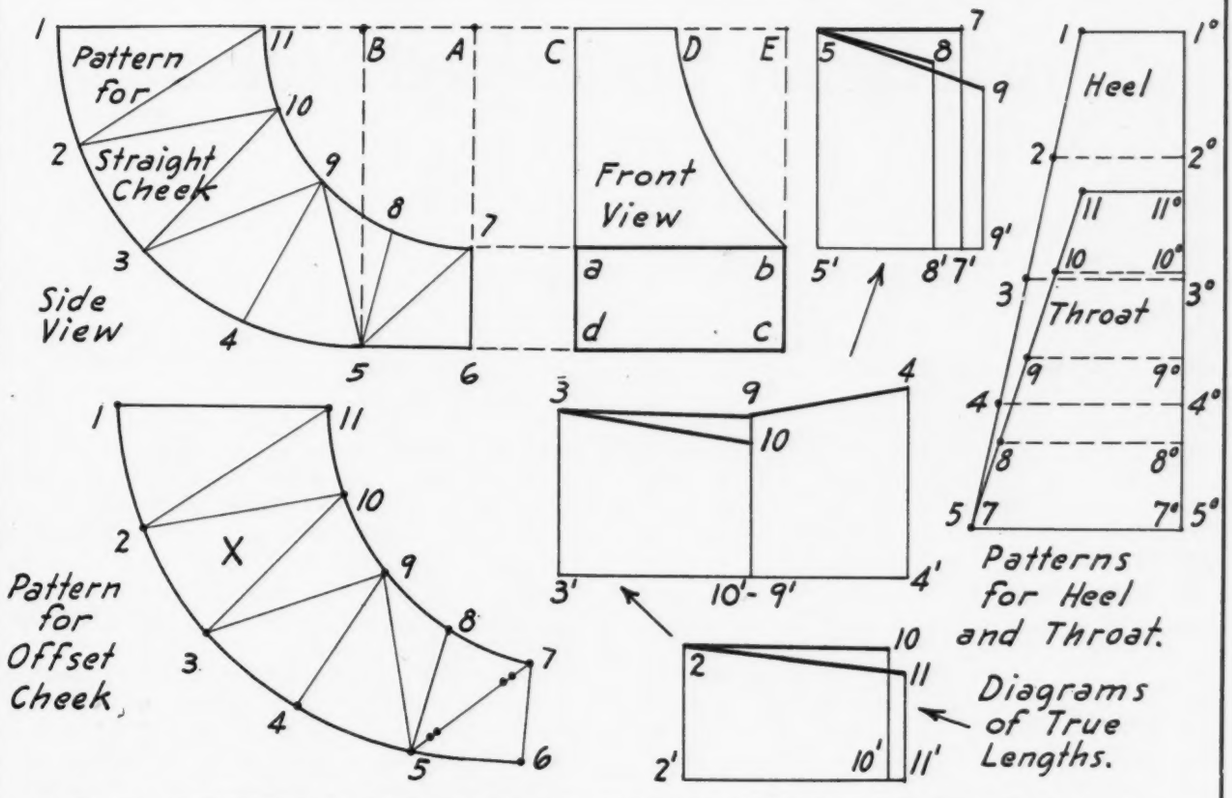


FIG. - 7 PATTERNS FOR CURVED TRANSITION OFFSET ELBOW

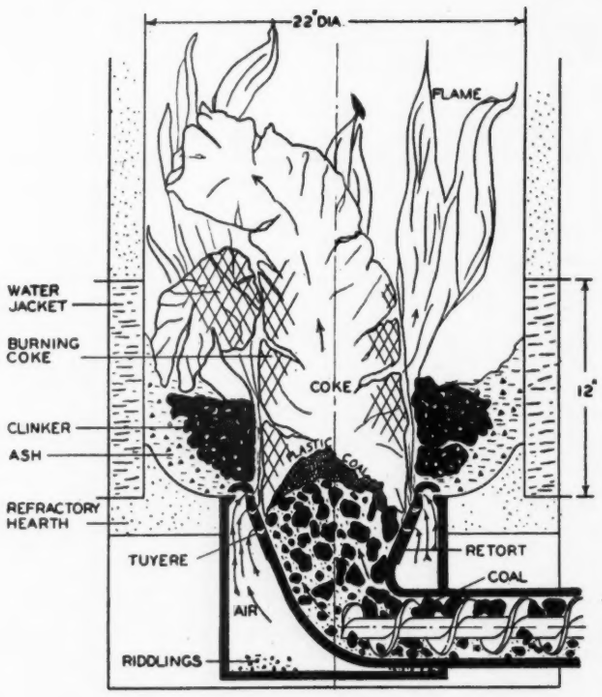


Fig. 3—Cross section of retort and fuel bed with strongly caking coal.

Intermittent operation. Coal size 1¼ in. to 0. Btu per hour heat release, 187,500; 85 per cent excess air; feed rate, 34 lb. per hour.

The Combustion of Bituminous Coal in a Small Underfeed Stoker§

By

Ralph A. Sherman* and E. R. Kaiser†

Smoke

As discussed in part 1 of this article, the volatile matter of the coal is liberated as the coal passes through the plastic stage and is formed into coke. As this occurs at the level of the tuyeres where the combustion air enters the fuel bed, the gas and air are thoroughly mixed and the hydrocarbons are burned without cracking into carbon. During "on" periods of stoker operation, therefore, no smoke is produced unless the air-coal ratio is reduced to near the theoretically required value.

When the heat requirements have been met and the stoker shuts off, distillation of gases from the plastic coal and semi-coke continues, but little air is now entering the tuyeres, the hydrocarbons are cracked as they pass over the hot coke, and smoke is produced. Records have been made of the concentration of smoke produced as it is affected by the air-coal ratio, by the size of the coal, and by the type of coal. The data show that the smoke decreases as the air-coal ratio increases, but that the size of the coal is a much smaller factor in determination of the amount of smoke than the type of coal. For coals in the same content of volatile matter, the concentration of smoke appears to be greater with the coal of greater caking tendencies.

The amount of smoke in the "off" periods can be decreased by increase of the excess air in the "on" periods. An increase in excess air will decrease the efficiency of heat transfer in the boiler or furnace. Therefore the attainable efficiency for a given allowable smoke concentration will be less for a coal with greater smoking tendencies.

Judged by the familiar standards of the appearance of the stack, the smoke density from the laboratory test furnace with the smokiest coal that we have yet tested exceeds No. 3 Ringelmann for short intervals only. This degree is mentioned because many municipal smoke ordinances limit the production of smoke to six minutes of No. 3 smoke in an hour. From a

§Reprinted from a pamphlet by the same name published by the American Institute of Mining and Metallurgical Engineers, New York.
*Fuel Engineer, Battelle Memorial Institute, Columbus, Ohio.
†Assistant Fuel Engineer, Battelle Memorial Institute.

domestic furnace or boiler, the smoke would generally be less because of the leakage of air through cracks and slots in the firing door; this leakage would probably only dilute the smoke and not actually burn it, because it was not mixed with the gases at the proper place.

Ash and Clinker

The individual pieces of coal entering the stoker retort have various petrographic structures. Some consist largely of coalified wood and contain only 1 or 2 per cent of finely divided and well dispersed inorganic matter. Others contain higher percentages of ash-forming materials such as sand, clay, shale and stone, depending upon the seam, care in mining, or degree of cleaning. Each piece of coal loses its combustible and volatile constituents in the fire, leaving only the inorganic structure in modified form.

Some ash fuses into beads at the surface of the coke as it is released, but most of it is freed from the coke in unfused flakes or grains. A part of the ash may be carried out of the furnace with the gases, but by far the largest part remains on the hearth.

Starting with a clean hearth, whether or not a refractory fillet has been provided, as shown in the laboratory test furnaces, the first ash tends to fall and remain at the places of least turbulence, which is at the corner of the wall and the hearth. The ash layer thickens with time and it seeks its angle of repose sloping upward from the retort to the wall. The ash near the retort is exposed to widely fluctuating temperatures which at times are high enough to fuse the ash or some parts of it so that it forms a ring of clinker concentric with the retort. Thus the loose ash is converted into a few compact and dustless pieces, which can be conveniently removed daily or at longer intervals, with the clinker tongs provided with the stoker.

The degree of fusion depends on the temperature attained in the fuel bed, the chemical composition and homogeneity of the ash, and the time of heating. Coals of which the ashes have high fusion temperatures may cause difficulty during mild weather when the temperature is not high enough to fuse them. A wide range of ash-fusion temperatures has not yet been covered in the laboratory tests, but it is known that coals with ash softening temperatures from 2000° to 2700° F. have been used successfully.

The clinker is generally weakly sintered at the bottom and lies upon a layer of loose ash. It builds up vertically and outward radially as more ash accumulates. The inner face is nearly a vertical wall, somewhat irregular but generally well fused, which forms a retaining wall for the ash and an annular channel through which the combustion products pass.

Because the degree of fusion of the ash into clinker is a function of time as well as temperature, the suitability of a coal for small stoker use, from the standpoint of the type of clinker formed, cannot be judged by a short-time burning test. This is particularly true if the area of the hearth of the furnace is large with respect to that of the stoker retort. Time must be allowed for the ash to accumulate between the furnace walls and the retort to bring it to the zone where the temperature is in the range of the ash fusion.

Over-all Stoker Operation

The rate of coal feed on small stokers is generally variable; on most stokers it is variable by three to five steps, as 10, 20, or 30 lb. per hour, and on some it is continuously variable over a range of three or five to one. The specified rates of feed are only nominal, as at any given setting the rate may vary by as much as 25 per cent, dependent on the bulk density that is affected by the size and distribution of sizes of the coal, on the top size of the coal, and, to some extent, on the friability of the coal.

The rate of air supply likewise is variable, generally continuously, over a wide range by means of a damper at the inlet of the fan or in the air duct between the fan and the stoker windbox. The fans used are multiblade centrifugal fans, which have the general characteristic of decrease of delivery with increase of the static pressure against which they operate. Many stokers now incorporate some method of automatic control to offset the natural tendency of the fan output to decrease with increase in static pressure. Generally the aim is to maintain the delivery constant regardless of the static pressure; within, of course, the limits of the cut-off pressure of the fan.

Nicholls[10] has shown that at low rates of air supply the rate of burning is fixed by the rate of air supply, and at high rates of air supply the rate of burning is limited by the rate of ignition. However, these rates are beyond the rates at which the small stoker is designed to function, and with any given rate of coal feed, and over a wide range of rates of air supply, the rate of burning will equal the rate of coal feed. This is obviously necessary if uniform, continuous operation is to be maintained.

Let us assume a stoker fuel bed in which the rates of coal feed and air supply and the thickness of fuel bed are at some constant equilibrium values. If the rate of coal feed is maintained the same but the rate of air supply is increased, the rate of burning is increased for a short time because each pound of air will continue momentarily to burn the same weight of fuel; because more air is supplied, more fuel will be burned. Therefore the amount of fuel in the stoker fuel bed will decrease; that is, the bed will become thinner, which will cause the amount of fuel burned by each pound of air to decrease until the rate of burning is again just equal to the rate of fuel feed. The composition of the flue gases will have changed and the depth of the fuel bed will have decreased, but the rate of burning will again have become constant at the previous rate.

Similarly, if the rate of air supply is maintained constant and the rate of feed is increased, the rate of feed will temporarily be greater than the rate of burning, until the fuel bed has increased in thickness to the point at which the weight of fuel burned by each pound of air is great enough to bring the rate of burning into equilibrium with the rate of feeding.

This discussion shows that the thickness of the fuel fed, or rather the amount of fuel in the bed, at any time is a function of the rate of feed, the rate of air supply, the type of coal and the size of coal. The fuel bed thick-

10. P. Nicholls: Underfeed Combustion, Effect of Preheat and Distribution of Ash in Fuel Beds. U. S. Bur. Mines *Bull.* No. 378 (1934).

(*Continued on page* 86)

Problems of Air Conditioning A One-Story Club Building

By B. L. Schwartz
Pittsburgh, Penna.

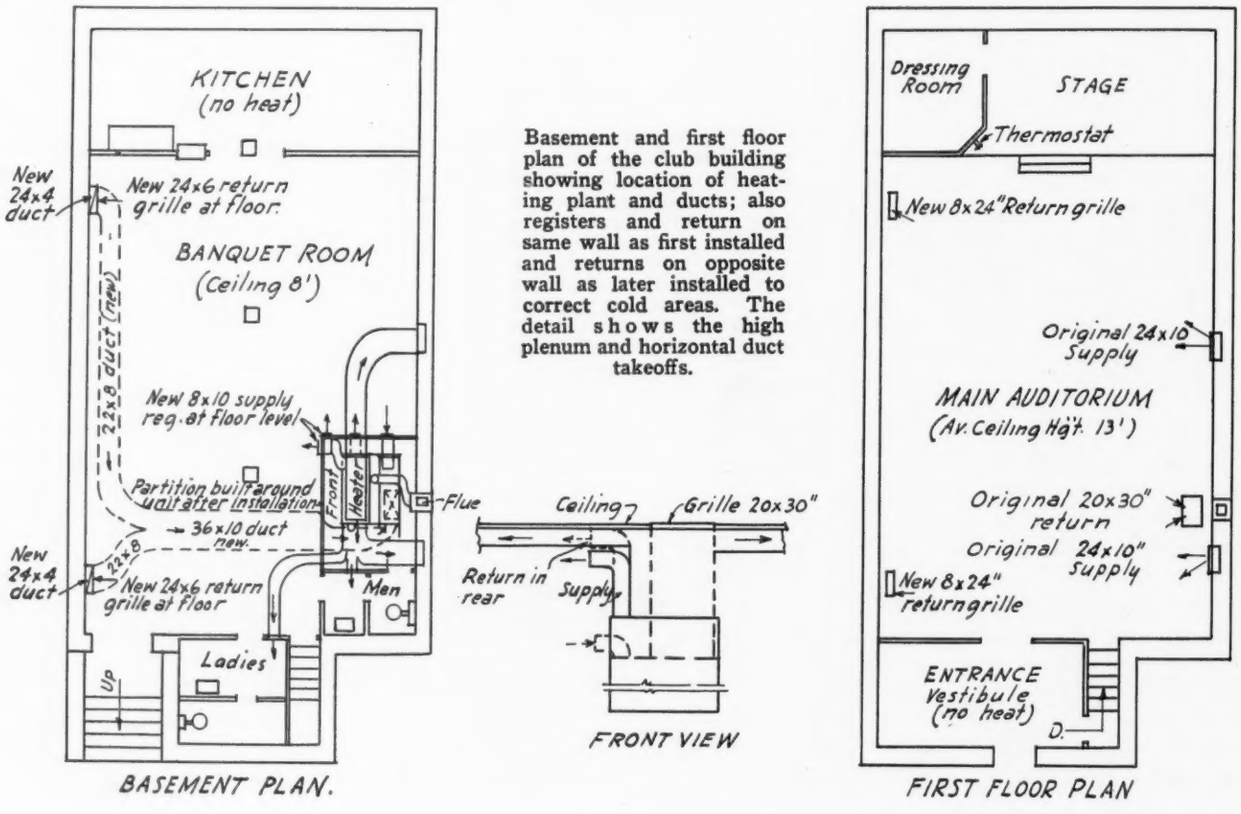
IN the spring of 1935 the Squirrel Hill Community Club of Pittsburgh purchased the old Gospel Hall building at 911 Hazelwood Ave., Pittsburgh, Pa. Because the members decided to convert the building into a club house and entertainment headquarters, one of the first considerations was the installation of an adequate heating and air conditioning system.

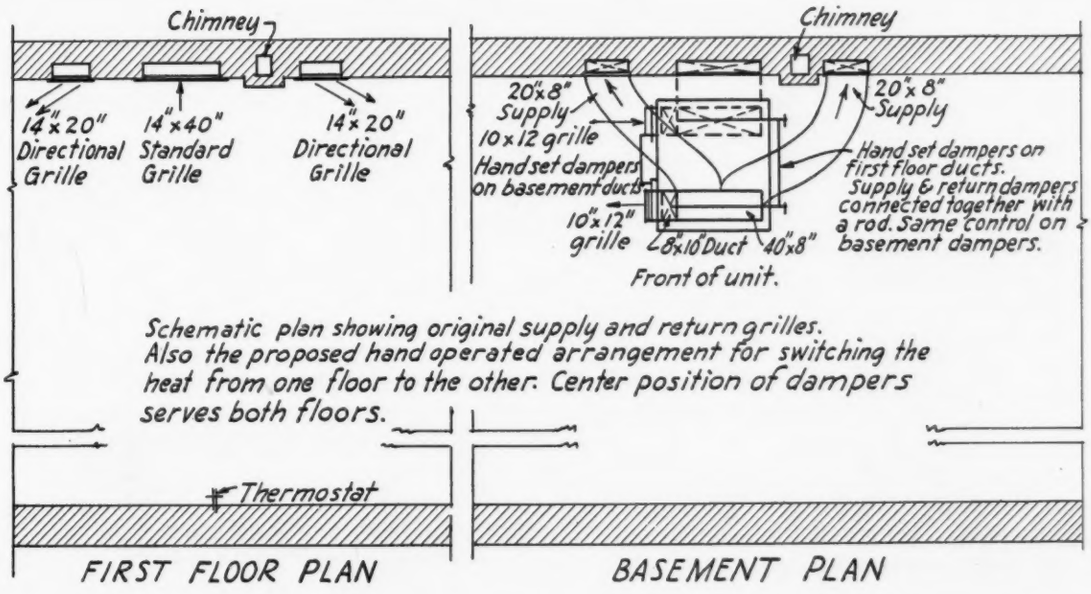
The building is a one-story structure of frame construction 48 feet long, 28 feet wide and has an average ceiling height of 13 feet on the first floor. There is an additional vestibule in the front, which really makes the building 58 feet long. There is a basement under the entire floor, with the exception of the vestibule. The basement ceiling height is limited to 8 feet and is built up on solid ground; with a cement floor. The building is exposed on all sides and is subject to plenty of winds from all directions. There is no insulation of any sort; and the construction is such as to permit a somewhat more than normal heat loss.

As is customary in most public and community organizations, nearly every member and his brother (or sister) had a friend who was anxious to lay out this job or render advice. Hence the many and varied layouts submitted resulted in educating the committee in a rather complete course in heating and air conditioning engineering.

Among the proposals submitted for consideration was one using a Bryant unit; and this turned out to be the approved plan. The specifications provided for a gas-fired air conditioner; complete with automatic controls, safety pilots, blower, filters, automatic humidifier, etc. The heater was placed on the basement level, in one corner of the banquet room. After the equipment was placed, an enclosure was built around it to serve the double purpose of concealing the apparatus and to prevent tampering with the controls, etc. A very simple system of ducts connects the two supply grilles serving the first floor; both of these being on the same side of the wall. The longest run from the heater does not exceed 15 feet. The outlet or supply grilles are baseboard type, directional flow faces. One return, a floor type intake grille, was placed between the two supplies. The location was immediately above the heater on the first floor. No heat was provided for the vestibule.

The basement supplies consist of one register for




Chimney
14"x20" Directional Grille
14"x40" Standard Grille
14"x20" Directional Grille
Chimney
20"x8" Supply
10x12 grille
Hand set dampers on basement duct
20"x8" Supply
Hand set dampers on first floor ducts. Supply & return dampers connected together with a rod. Same control on basement dampers.
10"x12" grille
8"x10" Duct
40"x8"
Front of unit.
Schematic plan showing original supply and return grilles. Also the proposed hand operated arrangement for switching the heat from one floor to the other. Center position of dampers serves both floors.
Thermostat
FIRST FLOOR PLAN
BASEMENT PLAN

The distribution system was zoned so that the basement or first floor could be cut off by means of a manual damper. It was found that club members tampered with the setting so the damper was set to heat both floors and was locked in position. The return shown at the left was later changed to two returns on the opposite wall.

the banquet room; the outlet being about five feet above the basement floor level and two small supplies for the corresponding toilet rooms on this floor. No heat is provided for the kitchen. There is but one return from the basement level; this being from the banquet room and consists of an intake at the furnace manifold about four feet above the floor level.

Automatic Control

The original plan provided for thermostatic control of each floor. Separate thermostats were to operate damper motors in the respective ducts serving each floor. If either thermostat called for heat, it would cause the gas to come on in the burners of the furnace; but if both thermostats were satisfied, the main burners would shut off. The pilots, of course, to remain on at all times during the heating season.

The blower is normally off until sufficient heat has developed within the bonnet of the furnace to automatically start the motor drive of the blower. When the bonnet temperature falls below that point at which the air delivery might feel cool, it automatically shuts the blower off. These limits in this particular job were fixed at 135 degrees "on" and 120 degrees "off."

The duct work was installed as outlined above, but the dual thermostatic control plan was temporarily modified to that of a single thermostat on the first floor only. Separate hand control dampers to permit switching the heat distribution to either floor (or both) were installed. Full automatic controls may be added at any time.

As soon as cold weather set in, we began to fear that a mistake in engineering design had been made. The club members and guests were either too warm or too cool; depending on who manipulated the controls. However, we finally convinced the committee that the dampers should be set to heat both floors and that the enclosure around the heater be kept locked to prevent tampering with the control dampers. This arrangement helped to overcome that difficulty.

Spotty Heating Problem

When more severe weather came, another and more serious trouble developed. There were emphatic complaints of unequal and spotty heating; particularly on the opposite side of the building from where the supply registered were placed. We played with this job for quite a while and then decided that some drastic change other than mere adjustments were needed to make this job perform as intended. Our test data and anenometer readings had already told us that we were not getting the air circulation on the far side of the building, even though we were getting air velocities in excess of 800 feet per minute at the registers. We decided that the cure had to be the installation of return air intakes on the opposite wall from the supply locations in order to assure proper air motion and distribution over the entire space. We also decided to introduce the supply air in the banquet room at the floor level and to take return air from the opposite side walls.

The club committee was advised of our decision and they agreed to permit us to install the additional ducts required to correct the job. This work was finished after the really severe weather was over, but it was evident at once that the desired results had been obtained. Air distribution is now uniform throughout the first floor and the banquet room and a satisfactory temperature maintenance is being upheld in all weather conditions to date. We have had several weeks of below freezing weather this winter so far, with a few days of 10 to 20 degrees temperature thrown in for good measure. Uniform temperatures and air distribution have prevailed at all times during this time.

It is interesting to note that air velocities from the floor level supplies in the banquet room range from 950 to 1050 feet per minute. The heated air is forced

"down hill" a matter of six feet from the top of the heater manifold. Supply registers on the first floor average 900 fpm. Return grille velocities (other than the original intake on the first floor which averages 300 fpm.) range from 125 to 200 fpm. This applies to both floor locations. It is to be noted that the lower floor return air is drawn in at the floor level and then carried to the ceiling. From there, it is carried along the ceiling level to the rear of the heater unit where it then taps into the return air manifold.

This job taught us something we probably should have known before; namely, that one should not expect to properly heat a building which is to be used for occupancy with supplies and returns on the same side of the walls unless such rooms are less than 15 feet wide. This limit may not be the maximum; but we do know that 28 feet is too much. An exception to this may be made if velocities in excess of 1200 fpm. are employed; but this is not considered good practice in heating work using base type supply grilles.

Design of System

Heat loss calculations covering this job are indicated on the attached data sheet. This shows a total of 127,600 Btu's required without the vestibule or basement kitchen. The heater has an input rating of 200,000 Btu's per hour. Hence it is apparent that the unit has reserve capacity for either or both of these rooms; should it be desired to add them to the main heating plant.

The blower which delivers 2,000 cfm. is a double fan unit of the squirrel cage type driven by a one-third HP motor and V belt drive. There is an adjustable drive pulley on the motor shaft, which permits variations of the blower speeds from 361 to 500 RPM. The motor and drive are mounted on the outside of the main housing for facility of oiling, filter inspection and adjustments.

The automatic humidifier is of the pan type; with a fixed (but adjustable) evaporating level. Each of the five heating sections has one of these pans on the top where it receives the most heat for evaporating purposes and where they will not interfere with the air stream in any way. These pans are inter-connected and are fed from an automatic float type valve mechanism at the side of the heater manifold. The evaporating rate can be changed at any time by merely raising or lowering the float stem on the valve rod.

Filters are two in number. They are the permanent, cleanable type. This type is very efficient if the filters be cleaned as required and if they be sprayed with oil after each cleaning.

Summer Operation

A summer slide is provided for air circulation in warm weather. This provides 4½ air changes per hour. Due to the large storage effect which the basement floor provides, a lowering of room temperatures ranging from 2 to 8 degrees can be obtained for several hours. This temperature drop, when added to the known cooling effect caused by definite air circulation, has created a very pleasing result for warm weather operation.

Groups of people ranging from 20 to several hundred gather in this club building almost every day. Activities vary from lectures, entertainments, dances, bridge parties, dinners, etc., to religious meetings. The system (after the necessary alterations and corrections were made) has been most satisfactory under these varying requirements. It responds rapidly to changes in requirements and is very flexible.

We had a little trouble at first to convince the various committee chairmen that temperatures will not rise or fall instantly as the thermostat lever is moved. It was also a matter of education to convince them that once the dampers were adjusted for equal heat distribution, no change should be made in the damper settings. These matters were finally ironed out to everyone's satisfaction. The final result is a transformation from what was originally a poorly designed and improperly operating job, to one that was corrected to give complete satisfaction.

The heating contractor on this job was Wickes & Co., 811 Amity St., Homestead, Pa. Both Hamilton R. Wickes and his wife are charter members of the Squirrel Hill Community Club. This accounts in part for Mr. Wickes great interest and cooperation in making this job what it should be.

The engineering layouts, both original and corrected, were contributed by the writer and if nothing else (aside from the fact that the job had to be made right) added one more chapter to a field of knowledge which we are just beginning to scratch.

Cubic Content K=.021				WALLS K for walls .285			GLASS K for glass 1.14		ROOF K = .285			TOTAL Btu
Room	Dimen.	Cfm	Btu	Dimen.	Sq.Ft.	Btu	Sq.Ft.	Btu	Dimen.	Sq.Ft.	Btu	
Auditorium	48x28x13	17,472	26,208	124x12	1488	29,760	216	12,960	30x48	1440	28,800	97,728
Banquet Room	38x27x8	8,208	12,312	96x8	768	15,360	35	2,100	Floor Loss K=.07 38x27	1026	5,130	34,902
Men	6x7½x8	360	540	13½x4	54	180	6	360	6x7½	45	225	2,205
Ladies	8x12x8	768	1092	20x4	80	1,600	6	360	8x12	96	480	3532

Total Required = 138,367 Btu

Data sheet for the installation showing heat loss coefficients used for structural parts, with areas and losses in Btu.

Forced Air Heating Facts From the Research Residence

By S. Konzo

Special Research Associate
Engineering Experiment Station
University of Illinois

These discussions of some of the different methods of designing duct systems are for the purpose of presenting the essential details of each, and to compare their respetive advantages and disadvantages. No attempt has been made to "recommend" any one method in preference to another. A study of these various methods should indicate those which may be considered as suitable for a given type of installation.

Introduction

IN the preceding articles the essential details of several different methods of designing individual duct systems were presented. It is the purpose of these discussions to present only the essential details, and to compare respective advantages of these various methods. It should be understood that no attempt has been made to "recommend" any one method in preference to another. The previous discussions have been limited to individual duct systems, since the explanation is simpler and the fundamentals involved apply equally well to trunk systems.

In this issue the design of trunk duct systems will be considered in greater detail. Since so many variations of design methods are in use, only the basic methods will be considered. In order to show more clearly the differences that exist in the results obtained by the various methods, a sample installation will be taken and numerical values will be obtained for each method. In Fig. 1, it is assumed that four rooms, *a*, *b*, *c*, and *d* require respectively 200 cfm, 400 cfm, 150 cfm, and 300 cfm.

TABLE 2.
Velocities Through Ducts and Registers
(Values commonly adopted in design)

	Low Velocity System f.p.m.	Medium Velocity System f.p.m.	High Velocity System f.p.m.
Trunk	500	750	1000
Branches	450	600	750
Stacks	350	500	600

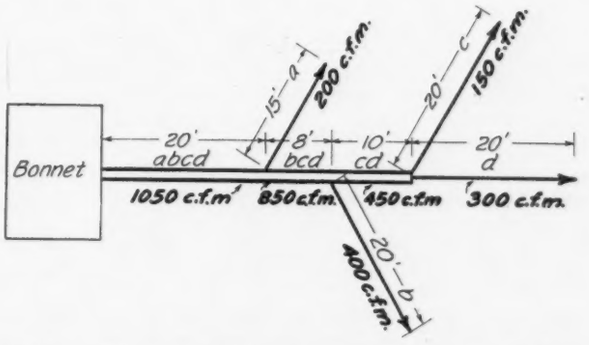


Fig 1.—Diagram showing arrangement of ducts in the typical example.

Design by Velocity Method

A. Velocity Method. 2. Trunk Duct System.

(*a*) Since many of the details of the calculation procedure have been explained in previous articles for the individual duct systems, the discussion of the

TABLE 1.
Typical Example Showing Velocity Method of Design

1	2	3	4	5	6		7		8	9	10
					Duct Area		Duct size inches				
Duct	Type	Volume Cfm.	Equivalent Length ft.	Allowable Velocity,* f.p.m.	Sq. ft.	Sq. in.	Depth	Width	Equivalent Diam., In.	Friction per 100 ft., In.	Actual Friction Loss, In.
abcd	Trunk	1050	20	750	1.40	201	8	25	15.1	0.090	0.018
a	Branch	200	15	600	0.33	48	8	6	7.7	0.125	0.019
bcd	Trunk	850	8	750	1.13	163	8	20	13.7	0.100	0.008
b	Branch	400	20	600	0.67	97	8	12	10.7	0.085	0.017
cd	Trunk	450	10	750	0.60	86	8	11	10.3	0.110	0.011
c	Branch	150	20	600	0.25	36	8	5	6.9	0.120	0.024
d	Branch	300	20	600	0.50	72	8	9	8.8	0.130	0.026

*Allowable velocities assumed as: 750 f.p.m. for trunk and 600 f.p.m. for branches.

TABLE 4

Typical Example Showing Design by 10% Reduction Method

First Step

(Determination of duct sizes)

1	2	3	4	5	6		7	8	9	
					Round pipe area				Rectangular duct, Inches	
Duct	Type	Air Volume C.f.m.	Equivalent Length Ft.	Assumed Velocity, f.p.m.	Sq. Ft.	Sq. In.	Trunk Area* Sq. In.	Equivalent Round Pipe Dia. In.	Depth	Width
d	Branch	300	20	600	0.50	72	.....	9.6	8	9.6
c	Branch	150	20	600	0.25	36	.....	6.8	8	4.9
cd	Trunk	450	10	...	...	..	0.9(108) = 97	11.1	8	13.0
b	Branch	400	20	600	0.67	96	.....	11.0	8	12.9
bcd	Trunk	850	8	...	...	..	0.9(193) = 174	14.9	8	24.5
a	Branch	200	15	600	0.33	48	.....	7.8	8	6.3
abcd	Trunk	1050	20	...	...	..	0.9(222) = 200	16.0	8	28.5

*Area of trunk line assumed to be 10 per cent less than combined area of separate branches.

Second Step

Check of velocities and friction loss

1	10		11	12	13
	Duct Area		Actual Velocity	Friction Loss per	
Duct	Sq. In	Sq. Ft.	F.p.m.	100 Ft., In.	Friction Loss In.
d	77	0.54	555	0.085	0.017
c	39	0.27	555	0.130	0.026
cd	104	0.72	625	0.088	0.009
b	103	0.72	555	0.071	0.014
bcd	196	1.36	625	0.062	0.005
a	50	0.35	572	0.120	0.018
abcd	228	1.58	665	0.065	0.013

method of design for trunk duct systems will be presented only in bare outline. The calculation sheet for the "velocity method" is presented in Table 1. The values given in columns 1, 2, 3, and 4 are self-explanatory and may be obtained from Fig. 1.

The main feature of this method is that the allowable air velocities to be maintained in the trunks, branches, and stacks are determined first. The commonly accepted values for air velocities are given in Table 2. In this typical example, the allowable velocities listed in column 5 have been assumed as 750 ft. per min. and 600 ft. per min, for trunk and branch ducts respectively.

(*b*) The required duct areas listed in column 6 may be determined by dividing the value for cfm (column 3) by the value for fpm (column 5). The duct sizes listed in column 7 may then be determined from the duct areas.

(*c*) The second step in this process consists of the determination of the pressure losses. The values of the equivalent diameter of the ducts, listed in column 8, are determined from tables or charts previously presented. The "friction loss per 100 ft. of duct" can be determined from the friction chart from the known values of cfm and the equivalent diameter. The actual friction loss in each section of the duct system is then determined from the equation:

$$\text{Actual friction loss} = \left(\text{friction loss per 100 ft.}\right) \times \frac{\text{Equivalent length}}{100}$$

(d) From the calculated values of the friction loss, listed in column 10 of Table 1, the pressures required at each part of the duct system can be readily determined.

The maximum pressure loss is obtained for the duct system leading to room *d*.

That is:

$$\left(\begin{matrix}\text{Loss}\\ \text{to}\\ \text{Room } d\end{matrix}\right) = \begin{matrix}\text{Losses in ducts, abcd + bcd + cd + d.}\\ \text{or } 0.018 + 0.008 + 0.011 + 0.026 = 0.063 \text{ in}\end{matrix}$$

Similarly, the losses in the ducts leading to the other rooms are as follows:

$$\left(\begin{matrix}\text{Loss}\\ \text{to}\\ \text{Room } c\end{matrix}\right) = \begin{matrix}\text{Losses in ducts, abcd + bcd + cd + c.}\\ \text{or } 0.018 + 0.008 + 0.011 + 0.024 = 0.061 \text{ in.}\end{matrix}$$

$$\left(\begin{matrix}\text{Loss}\\ \text{to}\\ \text{Room } b\end{matrix}\right) = \begin{matrix}\text{Losses in ducts, abcd + bcd + b.}\\ \text{or } 0.018 + 0.008 + 0.017 = 0.043 \text{ in.}\end{matrix}$$

$$\left(\begin{matrix}\text{Loss}\\ \text{to}\\ \text{Room } a\end{matrix}\right) = \begin{matrix}\text{Losses in ducts, abcd + a.}\\ \text{or } 0.018 + 0.019 = 0.037 \text{ in.}\end{matrix}$$

(*e*) A tabulation of pressure losses in the ducts to each of the four rooms is given in Table 3:

TABLE 3

Pressure Losses in Ducts

(*Based on velocity method shown in Table* 1)

1	2	3	4
Duct to Room	Duct Friction Loss, inches	Pressure required at bonnet, inches	Pressure required by dampering to equalize pressure head, inches
d	0.063	0.063	0
c	0.061	....	0.002
b	0.043	....	0 020
a	0.037	....	0.026

In order to deliver 300 cfm out of the longest duct, a pressure head of 0.063 in. must be created at the bonnet. If this pressure is created, then there will be an excess of pressure available to deliver the air to the other rooms. This excess pressure listed in column 4 of Table 3 must be introduced by dampers.

(*f*) The main advantages of the "velocity method" of calculating trunk duct systems consists of:

1. Simplicity of design method.
   (See columns 1 to 7 in Table 1.)
2. Determination of air velocities in every part of the duct systems.
   (See Table 2 of recommended velocities.)

(*g*) The main disadvantages of the velocity method consist of:

1. Difficulty in determining pressure losses.
   (See columns 8 to 10 in Table 1 and also Table 3.)
2. Necessity of dampering to equalize pressure losses.
   (See column 4 in Table 3.)

Design by 10% Reduction Method

(*a*) This method is a modification of the velocity method just described and is characterized by extreme simplicity. The first step in the design consists in the selection of a design velocity for the branches only. See Column 5 in Table 4. In this respect it differs from the method described first, since in that method the velocities were determined for both the branches and the main trunk. From the known values of the air volume requirements (Column 3) and the assumed velocity in the branch ducts, the required round pipe area can be determined, as shown in Column 6. (Col. 3 ÷ Col. 5.)

(*b*) The second step in the process consists in determining the sizes of the main trunk lines. *It is assumed* that where two ducts converge to form a trunk duct, the area of that trunk duct shall be 10 per cent less than the combined areas of the individual ducts that converge at that point. For example, as shown in Columns 6 and 7 in Table 4, the required round pipe areas of ducts *d* and *c* are 72 sq. in. and 36 sq. in. respectively. The total combined area is equal to 108 sq. in. The size of duct *c-d* is made equal to only 90 per cent of 108 sq. in., or 97 sq. in.

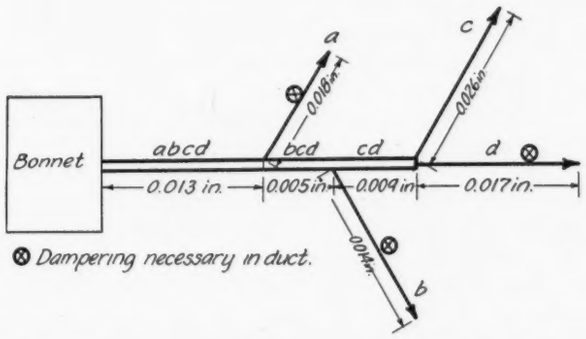


Fig. 2—Diagram showing pressure losses in ducts for 10% reduction method.

In a similar manner the size of trunk *b-c-d* is made equal to 90 per cent of the combined areas of ducts *b* and *c-d*, and the size of duct *a-b-c-d* is made equal to 90 per cent of the combined areas of ducts *a* and *b-c-d*.

(*c*) The equivalent round pipe diameter can be determined from the pipe areas, as shown in Column 8. The conversion to rectangular ducts is made in the customary fashion with the aid of tables or charts of equivalent pipe sizes.

(*d*) Up to this point no attempt has been made to determine either the friction loss or the actual duct velocities. This analysis is shown in the Second Step in Table 4. It may be noted that the maximum duct velocity was secured in the main trunk duct nearest the bonnet. In this example the value of 665 ft. per min. may be regarded as acceptable. It is essential in every case that this maximum velocity, which will invariably occur in the main trunk close to the bonnet, should be determined.

As an extreme case assume that a given main trunk line has ten branches each of which is 72 sq. in. in area and each of which delivers 300 cu. ft. per min. It will be found, that by the application of the 10 per cent reduction rule, that the air velocities in the main trunk will tend to gradually increase as the duct approaches the bonnet. In this particular example the increase in velocity will be at a rate of 5 or 6 per cent as each branch duct joins on to the main trunk. The air velocity in that portion of the trunk nearest the bonnet will be approximately 1018 ft. per min. Obviously, if the maximum air velocity is to be limited to a value not to exceed say 750 ft. per minute, some modification in duct sizes will be necessary. Therefore, it is good practice to check the air velocities that will be obtained with this method of design, particularly if the trunk duct has more than five or six branches.

(*e*) The values obtained from the termination of the friction loss in each part of the duct system are tabulated in Columns 12 and 13 of Table 4. These values have been placed upon the schematic diagram in Fig. 2. The frictional loss incurred in moving the air to Room *c* is the sum of the individual losses in the ducts *abcd*, (.013); *bcd*, (.005); *cd* (.009); and *c* (.026) = 0.053. This value of 0.053 inches represents the pressure required in the bonnet to force the required amount of air out to room *c*. In a similar manner the frictional loss in the ducts leading to rooms *d*, *b*, and *a* are equal to 0.044 in., 0.032 in., and 0.031 in. respectively. The differences between these losses and the pressure of 0.053 in., that will be maintained in the bonnet, will have to be imposed by dampers in each of the ducts. In this respect the reduction method is quite similar to the velocity method first discussed. For all practical purposes the advantages and disadvantages listed under the velocity method apply equally well to this modified method.

Design by Equal Friction Loss Method

B. Equal Friction Method. 2. Trunk Duct System.

(*a*) In this method the sizes of the ducts comprising the main trunk line are determined first and the actual friction loss is determined for the longest duct. The friction loss per 100 ft. of duct is arbitrarily selected, as shown in Column 5 of Table 5. The size of the ducts *abcd*, *bcd*, *cd*, and *d* are determined as shown in Columns 6 and 7. If the maximum air velocity, which will usually occur in that portion of the main trunk nearest the bonnet, is greater than is desirable, a lower value of the unit friction loss should be selected.

TABLE 5

Typical Example Showing Equal Friction Loss Method of Design
(*Loss in main trunk based on friction loss of 0.10 in. per 100 ft. of duct*)

First Step

1	2	3	4	5	6	7		8		9	10
Duct	Type	Volume C.f.m.	Equivalent Length Ft.	Friction Loss per 100 Ft., In.	Equivalent Diam., In.	Duct size, Inches Depth	Width	Duct Area Sq. In.	Sq. Ft.	Air Velocity F.p.m.	Actual Friction Loss, In.
abcd	Trunk	1050	20	0.10	14.8	8	24	192	1.33	790	0.020
bcd	Trunk	850	8	0.10	13.6	8	20	160	1.11	765	0.008
cd	Trunk	450	10	0.10	10.8	8	12	96	0.66	682	0.010
d	Branch	300	20	0.10	9.3	8	9	72	0.50	600	0.020
											0.058 Total

Second Step

1	2	3	4	5a	5b	6	7		8		9
Duct	Type	Volume Cfm	Equivalent Length, Ft.	Total Friction Loss, In.	Friction Loss Per 100 Ft., In.	Equiv. Diam. In.	Duct Size, Inches Depth	Width	Duct Area Sq. In.	Sq. Ft.	Air Velocity, Fpm
a	Branch	200	15	0.038	0.254	6.7	8	4.8	38	0.26	770
b	Branch	400	20	0.030	0.150	9.5	8	9.4	75	0.52	770
c	Branch	150	20	0.020	0.100	7.1	8	5.2	42	0.29	517

The actual friction loss for the longest run can then be readily determined by summing the values of the friction loss in the separate portions that comprise the longest duct. This calculation is shown in Column 10 in the upper portion of Table 5. It may be noted in this typical example that the total maximum friction loss is equivalent to 0.058 inches.

(*b*) The second step assumes that the total pressure loss in each of the ducts leading from the bonnet to the registers will be equal to the maximum pressure loss obtained for the longest run. That is, the total pressure losses in the following runs are assumed to be equal to 0.058 in.:

Maximum Loss,
abcd + bcd + cd + d = 0.058 in.
abcd + bcd + cd + c = 0.058 in.
abcd + bcd + b = 0.058 in.
abcd + a = 0.058 in.

Since the pressure losses, in those sections of the trunk line indicated by *abcd, bcd,* and *cd,* have been previously determined, the required friction losses in the branches *a, b* and *c* can be determined by difference. See values shown in Fig. 3.

That is:

if the losses in *abcd* + *a* = 0.058 in.
and the loss in *abcd* = 0.020 in.
then the loss in *a* = 0.058-0.020 in. = 0.038 in.

In a similar manner the losses in the branches *b* and *c* were determined as 0.030 and 0.020 in. respectively.

(c) If the total friction loss for branch *a,* which is 15 feet in length, is equal to 0.038 in., then the friction loss per 100 ft. of duct is equal to $\frac{100}{15}$ (0.038), or 0.254 in. In a similar manner the friction losses per 100 ft. are determined as 0.15 in. and 0.10 in. respectively for branches *b* and *c.* From the values listed in Columns 3 and 5a in the lower part of Table 5 the size of the branch ducts can be determined. It should be noted that the entire system is designed so that a minimum adjustment of dampers should be necessary.

(*d*) The air velocities that will be obtained in the branch ducts can then be calculated. If the values of the air velocity are larger than are desirable then the ducts should be arbitrarily enlarged and some provision should be made for introducing additional resistance by means of dampers.

(*e*) It may be noted that the pressure imposed on the fan is determined entirely by the frictional loss in the duct having the longest equivalent length. Since this pressure should be maintained at the lowest feasible value, if the power required for operating the fan is to be maintained at a low value, special attention should be paid to reduce losses in every part of the given duct. In fact the success of the entire system may to a large extent be dependent on the manner in which the frictional resistances are reduced to a minimum value in this long duct.

Summary of Three Design Methods

The three methods which have been described are not the only methods which may be used in designing trunk duct systems. A great many modifications are

(*Continued on page* 78)

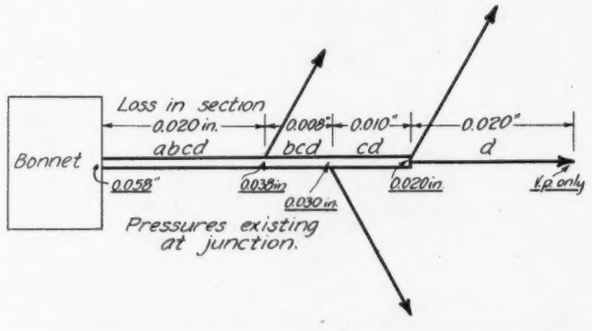


Fig. 3—Diagram showing pressures existing in various parts of duct system. (Equal friction loss method)

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ROCK ISLAND, ILLINOIS

STABILITY QUALITY RESPONSIBILITY

Humidity in House Heating* [Part 4]

Testing With a Household Thermometer

THE wet bulb thermometer is simply an ordinary thermometer, the bulb of which is wrapped with a small piece of cheesecloth or similar fabric saturated with water. The evaporation of water from this wet cheesecloth wrapper lowers the temperature of the air surrounding the bulb by an amount depending upon the rate of evaporation. As the rate of evaporation in turn depends upon the dryness of the air it is clear that the difference between the dry bulb and wet bulb temperatures is a measure of the relative humidity. Tables have been prepared showing the relative humidity expressed in per cent to correspond with varying differences covering a wide range of temperatures.

An ordinary household thermometer can thus be used to measure relative humidity. The thermometer so used should be one which has the bulb freely exposed, or if the bulb is protected should have the metal or wood surrounding it cut away.

The dry bulb temperature is first obtained by reading the thermometer with the bulb uncovered. The bulb is then covered or wrapped with a thin piece of cheesecloth or muslin which is saturated with water of approximately room temperature. The thermometer is placed at the point where the dry bulb temperature was obtained and fanned vigorously with a fan or sheet of cardboard for about a minute when the temperature reading is taken. The fanning is continued for a few seconds and the temperature again read. This should be repeated until the lowest possible reading is obtained. The reading so obtained is the wet bulb temperature.

*A booklet by the same name, published by the Resources Intelligence Service, Department of the Interior, Canada, and distributed by The Dominion Fuel Board. Five cents per copy. Reprinted by permission.

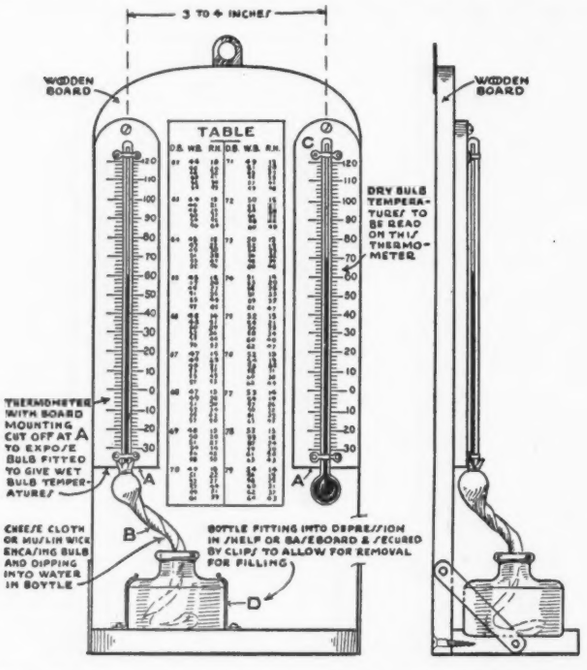

3 TO 4 INCHES
WOODEN BOARD
WOODEN BOARD
TABLE
DRY BULB TEMPERATURES TO BE READ ON THIS THERMOMETER
THERMOMETER WITH BOARD MOUNTING CUT OFF AT A TO EXPOSE BULB FITTED TO GIVE WET BULB TEMPERATURE
CHEESE CLOTH OR MUSLIN WICK ENCASING BULB AND DIPPING INTO WATER IN BOTTLE
BOTTLE FITTING INTO DEPRESSION IN SHELF OR BASEBOARD & SECURED BY CLIPS TO ALLOW FOR REMOVAL FOR FILLING
A
B
C
D

Fig. 13.—Two ordinary thermometers, reading alike, can be mounted on a board with the bulb of one enclosed in a wick which is kept immersed in water as shown makes a hygrometer. A scale for calculating the humidity can be copied from hand books.

TABLE I

Relative Humidity Table

D.B.[1]	W.B.[2]	R.H.[3]	D.B.[1]	W.B.[2]	R.H.[3]	D.B.[1]	W.B.[2]	R.H.[3]	D.B.[1]	W.B.[2]	R.H.[3]
°	°	%	°	°	%	°	°	%	°	°	%
58	41	15	64	45	15	68	47	13	72	50	15
	43	24		47	22		49	20		52	21
	45	33		49	30		51	27		54	28
	47	42		51	38		53	34		56	34
	49	52		53	47		55	42		58	42
	51	62		55	56		57	50		60	49
	53	72		57	65		59	58		62	57
							61	67		64	65
60	42	14	65	45	12	69	48	13	73	50	13
	44	22		47	20		50	20		52	19
	46	31		49	27		52	27		54	25
	48	40		51	35		54	34		56	32
	50	49		53	44		56	42		58	39
	52	58		55	52		58	50		60	46
	54	68		57	61		60	58		62	53
							62	67		64	61
62	44	16	66	46	14	70	49	15	74	51	14
	46	24		48	21		51	22		53	20
	48	32		50	29		53	29		55	26
	50	41		52	36		55	36		57	33
	52	50		54	44		57	44		59	39
	54	59		56	53		59	51		61	47
	56	69		58	61		61	59		63	54
							63	68		65	61
63	44	13	67	47	15	71	49	13	75	52	15
	46	21		49	22		51	20		54	21
	48	29		51	30		53	27		56	27
	50	37		53	37		55	33		58	34
	52	46		55	45		57	41		60	40
	54	55		57	53		59	48		62	47
	56	64		59	62		61	56		64	54
							63	64		66	62

[1]D.B.—Dry Bulb Temperature.
[2]W.B.—Wet Bulb Temperature.
[3]R.H.—Corresponding Relative Humidity in per cent.

NOTE.—The above table is prepared for use with a hydrometer of the dry and wet bulb type and covers the range of temperatures and corresponding relative humidities that may be found in house heating.

EXAMPLE.—Dry bulb temperature 68 degrees, wet bulb temperature 55 degrees. The relative humidity is found in the third column = 42 per cent.

Table I gives the relative humidities which correspond to the various combinations of dry and wet bulb temperatures that are to be found under average house-heating conditions. Thus if the dry bulb temperature is 70 degrees and the wet bulb is 57 degrees the relative humidity is shown by the table to be 44 per cent.

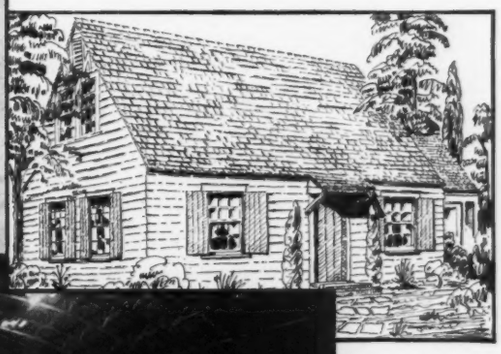
A Home-Made Hygrometer

Hygrometer may be made by mounting two thermometers (as sold for household use) side by side about three and one-half inches apart on a board which is fitted to hang from a hook on the wall or with a base which will enable it to stand on a table (Figure 13). Care should be taken in selecting the thermometers to obtain two that give accurate temperature readings at or near the usual room temperatures, or at least that give readings which, while not absolutely accurate, agree over that range. The bulbs should be freely exposed to the air as described in the preceding section by cutting away the enclosing wood or metal where

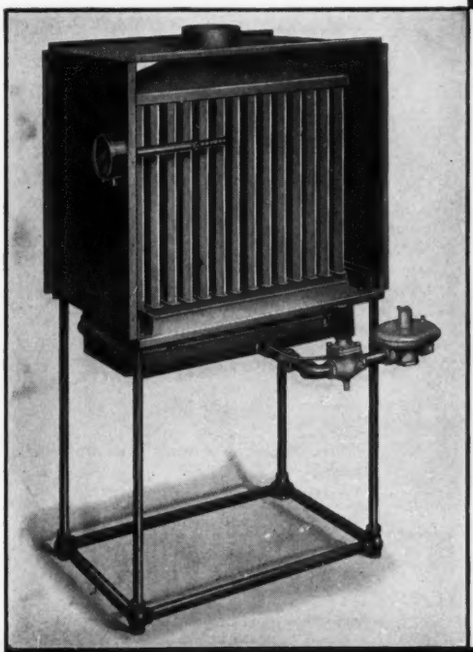
(*Continued on page* 80)

PAYNE GAS APPLIANCES

Equalize Heating Problems



Above: Coliseum at Fort Worth, Texas, designed by Wyatt C. Hedrick and Elmer G. Withers Architectural Co., Inc., assisted by Richard Karl Werner and heated with 65 Payne "CB" Furnaces. Upper Right: One of 88 low-cost homes by Palmer & Sawtell of Atlanta, Georgia, heated with Payne Floor Furnaces.



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Research Activities In Residential Air Conditioning

By Brewster S. Beach

Consulting Editor

AN enormous amount of research work relating directly to, or closely allied with, the problems of air conditioning is under way. The research referred to covers only the work of laboratories, engineering experiment stations, association work and does not include the hundreds of special investigations conducted by manufacturers.

Program of NWAH & AC Assn.

The National Warm Air Heating and Air Conditioning Association continued a research study of summer cooling using water of 52 and 46 degrees temperature in coils during the summer of 1936 and will issue a bulletin covering this program within the next few months. All these tests were conducted in the Research Residence in Urbana, Ill., under the direction of the staff of the Engineering Experiment Station of the University of Illinois.

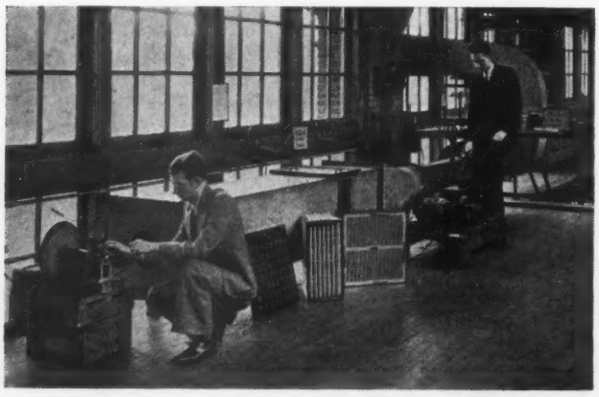
During the winter of 1936—1937 tests will be made by the same persons in the same place on—

1. Study of Controls for oil burning furnace. (a) With one speed fan. (b) With two speed fan.
2. Study of plant equipped with forced air registers.
3. Study of heat loss and temperature drop in ducts.
4. Study of pressure losses in take-offs and fittings.

For the future, we have the following tentative program:

1. Study of performance of stokers.
2. Study of effect of register locations in various rooms.
3. Study of insulation in side walls and ceiling.
4. A further study of humidifiers and humidification requirements.
5. A study of pressure losses through various types of registers.
6. Completion of studies started this summer on register locations but adapted to both heating and cooling.

The Research Advisory Committee composed of F. G. Sedgwick, Chairman; F. L. Meyer; R. A. Gulick; I. W. Rowell; T. W. Torr states that if any person has suggestions for additional investigations such suggestions will be given careful consideration.



Air filter test apparatus used at the University of Minnesota in co-operative research with the ASHVE.

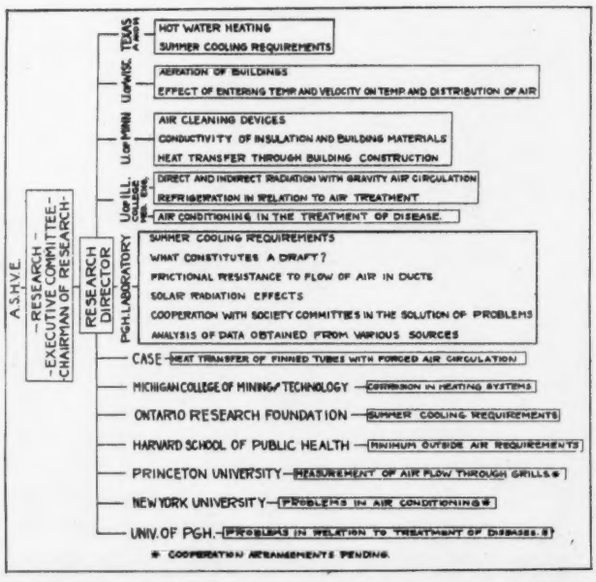
Program of ASHVE

The program of the American Society of Heating and Ventilating Engineers is both comprehensive and important. Not all of the investigations under way or proposed are of direct interest to our method of air conditioning, but the program of interest might be summed up thus—

1—The problem of providing humidified air in homes during the winter months will be one of the principal research projects to be undertaken. Paradoxical as it may seem, insulating materials, while highly effective in keeping out cold, are often subject to attack from within by humid air which penetrates the insulation or finds its way between spaces to condense inside the wall. Such effects as the alternate freezing and thawing of this condensate may impair the efficiency of the insulation. Too little is known of the exact cause of this phenomenon.

2—Comfort in summer cooling. The general complaint that conditioning is carried to uncomfortable extremes and that perhaps this practice results in colds has set afoot a project which already has demonstrated that summer cooling temperatures must be different in different parts of the country, and that temperatures may be higher than is often the case at present.

(*Continued on page* 90)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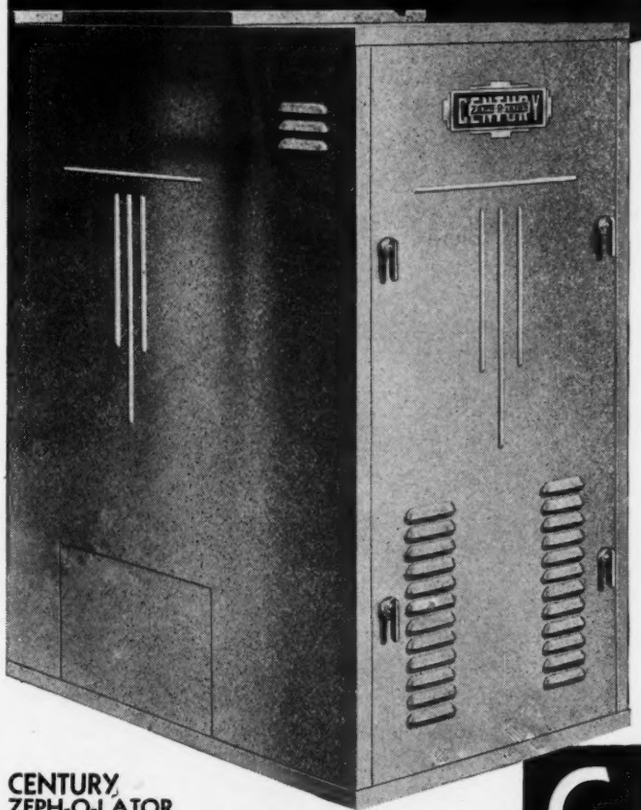
HEAT TRANSFER THROUGH BUILDING CONSTRUCTION
U. OF ILL. COLLEGE OF
DIRECT AND INDIRECT RADIATION WITH GRAVITY AIR CIRCULATION
REFRIGERATION IN RELATION TO AIR TREATMENT
AIR CONDITIONING IN THE TREATMENT OF DISEASE.
PGH. LABORATORY
SUMMER COOLING REQUIREMENTS
WHAT CONSTITUTES A DRAFT?
FRICTIONAL RESISTANCE TO FLOW OF AIR IN DUCTS
SOLAR RADIATION EFFECTS
COOPERATION WITH SOCIETY COMMITTEES IN THE SOLUTION OF PROBLEMS
ANALYSIS OF DATA OBTAINED FROM VARIOUS SOURCES
CASE — HEAT TRANSFER OF FINNED TUBES WITH FORCED AIR CIRCULATION
MICHIGAN COLLEGE OF MINING & TECHNOLOGY — CONDITION IN HEATING SYSTEMS
ONTARIO RESEARCH FOUNDATION — SUMMER COOLING REQUIREMENTS
HARVARD SCHOOL OF PUBLIC HEALTH — MINIMUM OUTSIDE AIR REQUIREMENTS
PRINCETON UNIVERSITY — MEASUREMENT OF AIR FLOW THROUGH GRILLS *
NEW YORK UNIVERSITY — PROBLEMS IN AIR CONDITIONING *
UNIV. OF PGH. — PROBLEMS IN RELATION TO TREATMENT OF DISEASES *
* COOPERATION ARRANGEMENTS PENDING.

Chart showing co-operative research program of ASHVE with university laboratories and departments and subjects under investigation.

$ales AT A PROFIT



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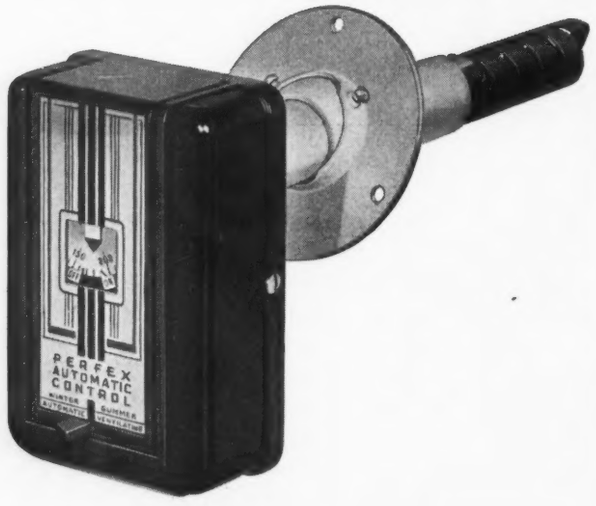
PERFEX



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This fan control is also available with a built-in, summer-winter switch as shown above. By means of this switch, the fan may be operated manually, without need of changing temperature settings—an exclusive Perfex feature.

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For more complete information and prices on these and other Perfex Controls shown in our new catalog.

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PERFEX

Konzo— Forced Air Facts

(*Continued from page 72*)

possible and a combination of methods may also be used to meet the exigencies of any given situation. However, the methods described form the bases of practically all the methods in use and hence may be regarded as fundamental methods. From a study of the characteristics of these methods, the following generalizations may be made:

1. The "velocity method" is a convenient one for determining duct sizes. The frictional losses should be checked, not only for determining the head against which the fan must deliver its air, but also to determine the approximate amount of dampering which will be necessary.
2. The "reduction" method is a modification of the "velocity" method. In the case of trunk lines supplying air to a great number of branch ducts, a check of the air velocities should be made at a point near the bonnet outlet.
3. The "equal friction" method is based on the assumption that a minimum of dampering will be necessary in the branches. The velocities should be checked in every part of the system.
4. A thorough familiarly of the friction chart is essential for a proper understanding of the possibilities inherent in each method of design. The use of diagram sketches similar to those shown in Figs. 1, 2 and 3 will aid in the analysis of design methods.
5. In the design of a duct system for any given installation, irrespective of the method of design which is used, a great many approximations will be made, including:
   a. the determination of factors affecting the heat loss from various rooms in the structure,
   b. the determination of the temperature drop of the warm air in the ducts,
   c. The determination of the friction loss through bends, bad fittings, around dampers, etc., and
   d. the magnitude of the coefficient of friction used in the friction chart.

All of these approximations tend to make the design of any design system subject to some errors. Any system, no matter how well designed, will require some amount of dampering.

The chief functions of any design method is to reduce to a minimum some of the uncertainties connected with the proper distribution of air and the correct selection of a fan. Any calculated values which have been obtained should not be regarded as infallible. Nor does any code or method of design remove the necessity of applying good judgment and sound common sense to the solution of any problem.

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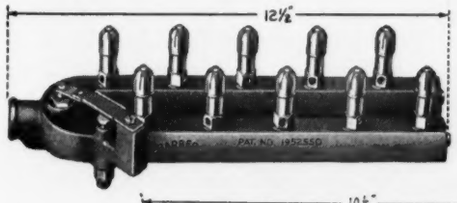
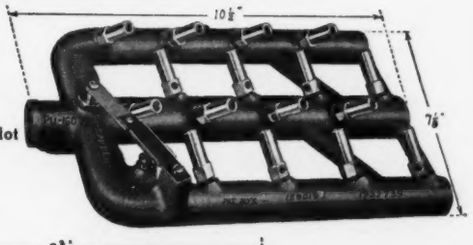


No. C. U.-90 Barber Burner with Safety Pilot



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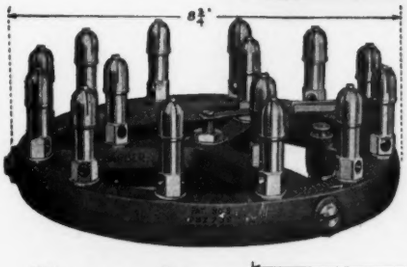

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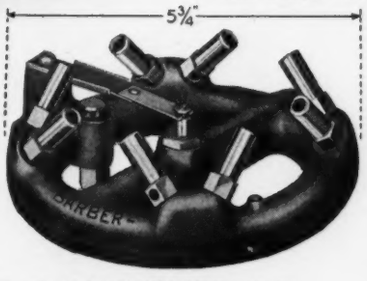
No. S. P.-15 Barber Burner with Safety Pilot



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RUDY

FOR LEADERSHIP LOOK TO THE LEADER

Humidity in House Heating

(*Continued from page 74*)

necessary. A small bottle filled with clean water is clipped to the base or to a shelf fitted to the board below the thermometer which is to be used to give wet bulb temperatures. A wick is made of clean cheesecloth or muslin, one end of which is made to encase the bulb and secured to it by a few stitches of thread, the other end dipping into the bottle. Capillary action will then keep the wrapping of the bulb saturated.

Dry and wet bulb temperatures are read immediately after the instrument is fanned until the minimum reading on the wet bulb thermometer is reached. The corresponding relative humidity is then taken from the table on the following page as already explained in the preceding section.

Summary

1. "Dry" air is inevitable in houses during the heating season with all present types of heating equipment, unless special provision is made for humidification.

2. "Dry" air is detrimental to health, and has a destructive effect on clothing, furnishings, furniture, and interior woodwork.

3. "Dry" air produces a sensation of cold at normal temperatures owing to excessive evaporation from the skin, and necessitates higher room temperatures for comfort.

4. "Relative humidity" is an expression in percentage of the relation between the moisture actually contained in air at any temperature and the moisture it can contain at that temperature. The lower the relative humidity the stronger is the water absorptive or abstractive power of air.

5. The outdoor relative humidity during the winter varies from 30 to 100 per cent. The relative humidity of indoor air should be at least 40 per cent for health and comfort but should not greatly exceed 50 per cent on account of the excessive frosting of windows (using double windows) that occurs with high relative humidities.

6. Relative humidities can be accurately determined only by the use of hygrometers or other humidity measuring instruments. The effective control of humidity conditions in house heating depends therefore upon information which can only be furnished by a hygrometer.

7. The average small house requires the special evaporation of from three or four to twelve or more gallons of water per day during the winter, depending mostly on weather conditions and ventilation. The continual use of the hygrometer is necessary to determine whether sufficient water is being evaporated.

8. Humidifiers or devices for supplying moisture to air are available for use in houses heated by any type of heating equipment. Householders should obtain definite information as to the capacities for evaporating water of the various humidifiers offered for sale before making a selection.

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YOU'RE SAFE

PACIFIC FORCED-AIR UNIT

Complete winter air conditioning and summer ventilating in one compact unit. No basement required.

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Pacific also makes gravity and blower furnaces, unit heaters, floor furnaces and all types of space heaters to meet any domestic, commercial or industrial heating specification.

PACIFIC GAS RADIATOR COMPANY

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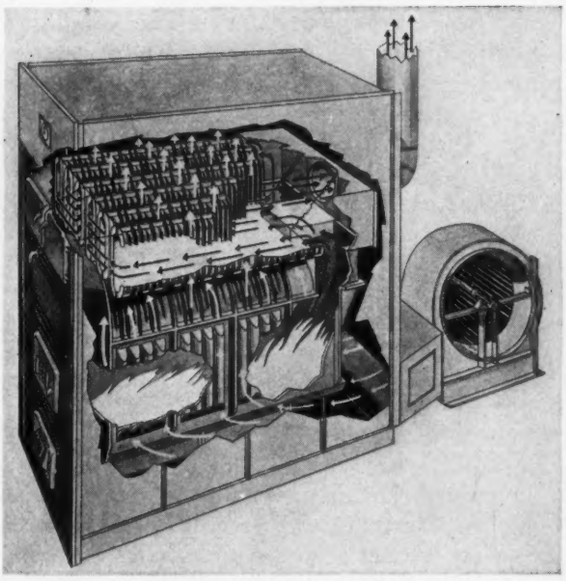
The ACME HEATER

"It's in the Fins"



PHYSICAL DATA—LARGE SERIES

Size No.	Dimensions Length	Width	Height	Grate sq. ft.	Heat Surf. sq. ft.	Free Area sq. ft. Min.	Free Area sq. ft. Max.	Wt. Lbs.	Max. Capacity Btu.
7	6'-6"	4'-0"	7'-0"	10.31	260	6.55	10.25	5900	900,000
8	8'-1"	4'-0"	7'-0"	11.91	340	7.73	12.50	7000	1,100,000
9	9'-8"	4'-0"	7'-0"	13.06	430	8.91	14.75	8000	1,300,000
10	11'-3"	4'-0"	7'-0"	14.43	500	15.82	22.62	9300	1,500,000
JUNIOR SERIES									
2	4'-6"	3'-6"	5'-8"	3.9	136	4.7	4.7	3200	350,000
3	6'-0"	3'-6"	5'-8"	6.1	183	5.9	6.9	4800	527,000
4	7'-6"	3'-6"	5'-8"	7.2	230	7.1	9.1	5000	634,000
5	9'-0"	3'-6"	5'-8"	9.3	280	8.3	11.3	6000	800,000

Note: For Automatic Firing Add 10% to Ratings Given.

Burns Any Kind of Fuel

The design of an all cast iron, direct transmission heater, such as the Acme, is not dependent upon the kind of fuel to be used. Any type of fuel may be burned. Suitable grates may be provided so that bituminous, semi-bituminous, anthracite coal, or other solids may be used with equal efficiency. Replacement of grates and linings by proper refractory material permits the use of automatic stokers on oil burning equipment.

Large Combustion Chamber

The Acme Heater provides ample space for the ignition of gases of combustion, regardless of the kind of fuel used. The unusually large combustion chamber, acting as "primary" heating surface, effects a very efficient transfer of heat, because of the great temperature difference between the burning gases inside the chamber and the air passing over the outside surface.

Efficient Radiator Section

Although the heating surface of the combustion chamber is large and efficient, still more heat must be extracted to obtain satisfactory overall efficiency. An inspection of the "phantom view" above will reveal how the gases of combustion enter the rear smoke chamber, flow to the front of the heater, and return again to the smoke-box. It is evident that the gases are held in intimate contact with the heating surface, six times the length of the heater, before they are permitted to escape.

High Ratio of Heating Surface to Grate Area

The radiator tubes are covered with extended surfaces, or fins, typical of those used on indirect heating coils. The long, oval tubes of the radiator provide an exceptionally large heating surface and, when combined with the surface of the combustion chamber, afford a remarkably high ratio of heating surface to grate area.

Balanced Construction

The construction of the Acme Heater provides ample free area and allows proper velocity of the air to be heated. Moreover, this air is brought into direct contact with as much heating surface as possible, resulting in the Acme of Efficiency.

ACME HEATING & VENTILATING CO., Inc.
4224 LOWE AVENUE **CHICAGO, ILL.**

The Perris Restaurant is one of thousands of small business places that have found it pays to install air conditioning. Get your share of this business!

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AIR CONDITIONING SYSTEMS
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Air conditioning fits right in with your warm air heating business. 1937 will be the biggest year in air conditioning history. The big season is just ahead . . . the time to get started, to get lined up for the orders waiting to be filled . . .is right NOW! Fill out and mail the coupon today.

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Please send information on U. S. AircO Air Conditioning Systems and exclusive dealer franchise.

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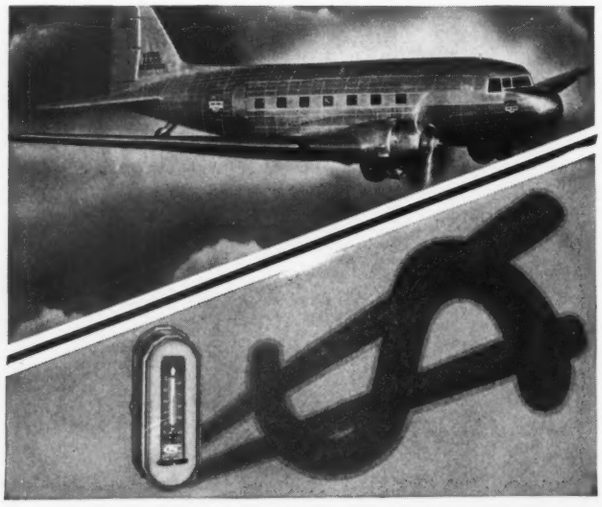

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Cook Controls will do that for you—the experience of hundreds of furnace dealers proves it.

Whether it's a Cook No. 218 System or the Cook No. 12 Heat Control, it is simple to install, easy to handle, service-free in operation and effective in doing a 100% job for your customers.

Important, exclusive selling features of Cook Controls—that mean greater comfort, convenience, safety, economy to customers—will give you a new powerful, convincing sales story that gets prompt and profitable action.

DO you want proof? Facts about the dependable, accurate, safe operation of Cook Controls? Evidence that dealers can sell Cook Controls profitably? Then take a postcard or letterhead and simply write "Prove it to me." We'll do it.

COOK CONTROLS

THERMOSTATS—FURNACE LIMIT CONTROLS
ZONE CONTROLS — BLOWER CONTROLS

COOK ELECTRIC COMPANY
2673 Southport Ave. CHICAGO

Neubecker—Air Conditioning Fittings

(*Continued from page 62*)

structed using the Pittsburgh lock. Take the girth of the heel from *1* to *7* in side view and place it on the horizontal line at the right as shown from *1* to *7*. Take the girth of the throat from *8* to *13* and set it off from *8* to *13*. Through *8-13* and *7* erect perpendicular lines as shown by a^I b^I, b^I c^I and b^{II} c^{II}, placing half of *a-b* in section *A* on either side of the center point *1* or *8* in the pattern and one-half of *b c* in section *A* on either side of points *13* and *7*. Connect lines from a^I to c^{II} and b^I to b^{II} also from a^I to c^I and b^I to b^I. These two patterns represent respectively the layout of the heel and throat to which flanges must be allowed for locking and joining to ducts as explained in connection with the heel and throat patterns in Fig. 5.

When the projection from *h* to *e* in the front view in Fig. 6 is not too great, the side view shown can be used for the cheek patterns, with the following caution. As the length of the slant lines in the heel and throat patterns are greater than the lengths on the center line *8-7* on which the girths were placed, it is usual to add the difference (not noticeable in this small drawing) as indicated at *X* at the bottom in the side view. This simplified method allows straight lines for the hammer lock which takes less time and labor, than the customary standing seam.

The foregoing method is also applicable to transition elbows rectangular to square. When a transition elbow is required where one side is straight, with the offset all on the opposite side, then the cheek on this opposite side must be laid out by triangulation. An elbow of this type is shown in Fig. *7* in which *1-6-7-11* shows a side view and *C-D-c-d* a front view. The size of the rectangle is shown by *a b c d* which is similar in size as shown along the top, but in a reversed position. As one side of the cheek is straight as indicated by *C-d* in the front view, then the side view will be the pattern for this straight cheek. The throat in the side view is struck from the center *A* as shown from *7* to *11*.

Make the distance from *7* to *6* equal to the narrow side of the rectangle and *11-1* equal to the wide side. Take the distance from *A* to *6* and set it off from *1* to *B*. Use *B* as center with *B-1* as radius describe the quadrant *1-5* to intersect the vertical line drawn from center point *B* at *5*. From *5* draw the horizontal line to meet *7-6* at *6*. Now space the curved heel line *1-5* in equal division as shown.

In similar manner space the curve throat in divisions shown from *7* to *11*. Connect points in heel and throat as shown. Use good judgment in drawing these connecting lines. Here we have the points *7-8* and *9* converging to *5; 5-4* and *3* to *9* while the balance are connected to opposite points. The patterns for the heel and throat are laid out at the right. Take the girth of the heel *1* to *5* in the side view, and place it as shown from *1*° to *5*° in the heel pattern. Take the girth of the throat *7* to *11* in side view and place it as shown from *7*° to *11*° in the throat pattern. Now take the distance *a-b* in front view and set it off at right angles

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EVERY FURBLO FURNACE BLOWER IS NOW GUARANTEED IN WRITING FOR 5 YEARS.

NOW! FURBLO Company backs your sales presentation with more than a furnace blower, which is superior in quality and efficiency, and with performance records that can not be duplicated by others—FURBLO adds a 5 YEAR WARRANTY *in writing* to prove definitely to the prospective buyer that a FURBLO furnace blower will do a good job right.

This 5 YEAR GUARANTEE *in writing* proves to the buyer that FURBLO is the right furnace blower to use.

This 5 YEAR GUARANTEE lowers sales resistance for you, makes it easier for you to sell at a better profit. The question of price becomes a secondary consideration.

Tell your prospect about FURBLO and the FURBLO 5 YEAR WARRANTY *in writing* and you sell.

FURBLO invites "Up and at 'em Dealers" to write for full details and prices. Invites them to learn the outstanding features of the new "Styled" FURBLO furnace blowers—to know why FURBLO leads—why FURBLO dealers sell the year around—why FURBLO 5 YEAR WARRANTY *in writing*, plus the many other FURBLO co-operations spell profits to the go-getter.—Write to-day!

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AIR CONDITIONING SALES AND ENGINEERING SCHOOL OF THE MAILS.
NO TUITION — NO FEES.

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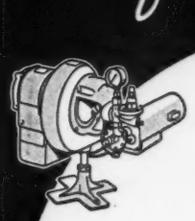
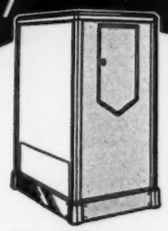
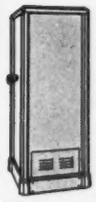
Complete Line

AUTOMATIC HEATING and AIR CONDITIONING Equipment


Oil Burners (8 sizes)


Boilers, Cast Iron, Steel (Oil, Gas, Stoker)

Air Conditioners (Oil, Gas, Stoker)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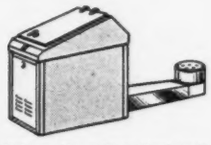
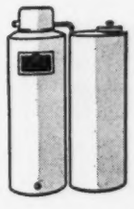

Stokers (for soft or hard coal) (5 sizes)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to 1^c-5° as shown by 5°-5. Again, take the distance *b-c* in front view and set it off at right angles to 1°-5° as shown from 1° to 1 and 11° to 11. Draw lines from 1 to 5 and 11 to 7 which completes the net pattern shapes for both heel and throat, to which edges must be allowed as explained in connection with the heel and throat patterns in Fig. 5.

Now from the various intersections 1° to 5° and 7° to 11° in the pattern shapes in Fig. 7, draw horizontal lines to meet the slant lines as shown by similar numbers. The divisions on these slant lines will be used in laying out the offset check pattern. The next step is to obtain the true lengths of the lines shown in the side view. To obtain the true length of the line 2-11 in the side view, set off this distance as shown by 2^I-11^I in the diagram of true lengths.

From 2^I and 11^I erect perpendicular lines equal to 2°-2 and 11°-11 respectively in the heel and throat patterns. Draw a line from 2 to 11 in the diagram, which will be the true length of the line 2-11 in the side view.

Again, to find the true lengths of the lines in the side view, from 5 to 9 to 8 to 7, set off these distances as shown from 5^I to 9^I to 8^I to 7^I in the diagram and make the vertical heights 5^I-5, 9^I-9, 8^I-8 and 7^I-7 equal respectively to 5°-5, 9°-9, 8°-8 and 7°-7 in the heel and throat patterns and connect these intersections by the lines drawn from 5 to 9 to 8 to 7 in the diagram. In this manner obtain the balance of the true lengths, all as indicated by similar reference numbers in the true length diagrams, indicated by the arrows and heavy lines.

Having obtained all the true lengths of the lines shown in the side view and the various true distances on the slant lines in the heel and throat patterns, the pattern for the offset cheek is developed as follows. Take the distance of 1-11 in the side view and set it off on any line as 1-11 in the offset cheek, which we will call *X*. Using 1 in *X* as center with radius equal to 1-2 in the *heel pattern* describe the arc 2, which intersect, by an arc struck from 1-1 as center with the *true* length 11-2 as radius thus obtaining the intersection 2 in *X*. Now with 11 in *X* as center, with a radius equal to 11-10 in the *throat-pattern,* describe the arc 10 which intersect by an arc struck from 2 as center with the *true length* 2-10 as radius, and obtain the intersection 10 in *X*.

Proceed carefully in this manner using alternately, first the proper numbered division along the *slant line* in the heel pattern, then the proper numbered true length; the proper numbered division along the *slant line* in the throat pattern, then the proper numbered true length, until the line 5-7 in *X* has been drawn. With radius 5-6 in the side view (which shows its true length) and 5 in *X* as center, describe the arc 6 and intersect it using 7 as center and 7-6 in the side view as radius. In other words 5-6-7 in *X* is a reproduction of 5-6-7 in the side view. On the line 6-7 in *X* a very slight bend is made as indicated by the double dots. Single edges must be allowed for seaming purposes as indicated in the 90-degree elbow in Fig. 5. Note that the lines in the pattern must connect and converge similar to the numbered lines in side view.

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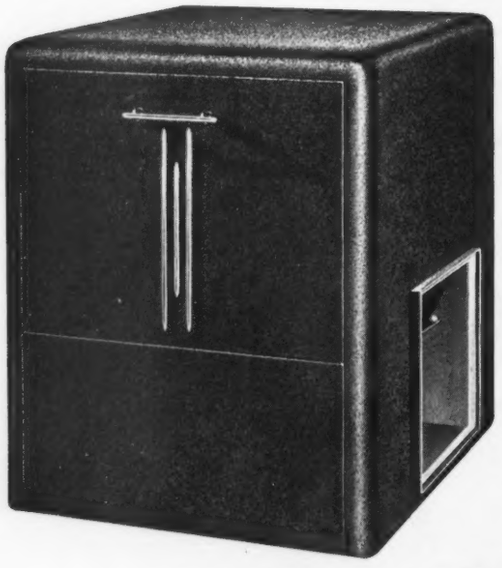

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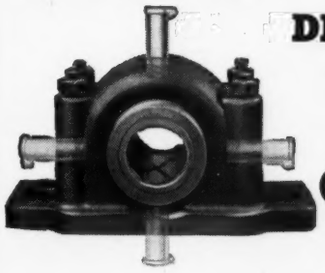


Randall

Right Side

Above is the new Randall Universal D.R.O.R. Pillow Block, showing the four possible mounting positions. Right: Cut-away section of ball of Universal Pillow Block, showing Double Reservoir Oil Return feature.

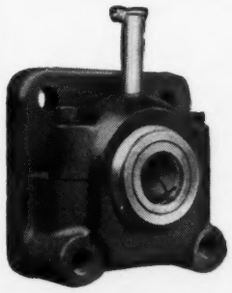
Left Side

THE new Randall Universal Pillow Block with double reservoir oil return feature, fills a need for a pillow block that can be mounted in any position. This type is rapidly being adopted for all types of blower applications.

Inverted

These sketches show how the Universal D.R.O.R. Pillow Block is easily mounted in alternate positions by removing oiler, turning ball and re-inserting oiler vertically.

RANDALL FLANGE-MOUNT PILLOW BLOCK



Randall Flange D.R.O.R. Pillow Blocks are designed especially for mountings on cabinet type air conditioners and unit heaters.

Cut-away section of ball of Flange Type Pillow Block showing Double Reservoir Oil Return feature.

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OBI

JOHNSON OIL BURNERS

Combustion in Small Stokers

(*Continued from page* 65)

ness is not an independent variable that can be controlled without change in the other factors. The familiar statement that one should carry a thicker or thinner fuel bed should be that one should decrease or increase the rate of air supply.

If a coal is noncaking and noncoking, so that a porous fuel bed is formed through which the air can penetrate freely, each pound of air will unite with its quota of combustible in a short distance and a relatively thin fuel bed will result. If the coal is caking and coking, of the type shown in Fig. 3, where combustion can occur only on the outside of the column of coke and on the relatively large pieces of coke broken off the coke column, a longer distance of travel is necessary for the air to unite with the combustible and a deeper fuel bed will result for the same air-coal ratio.

Effect of Intermittent Operation

This discussion has inferred continuous operation of the stoker but the same principles apply for intermittent operation. The rate of air supply to the stoker during the "off" periods is at a low rate, on the order of 10 per cent of that during the "on" period, but as the coal feed is stopped and the "off" period may be prolonged the fuel bed may burn down appreciably. At the beginning of the next "on" period, the rate of burning will be less than the rate of feeding, and the fuel bed will gradually increase in thickness again.

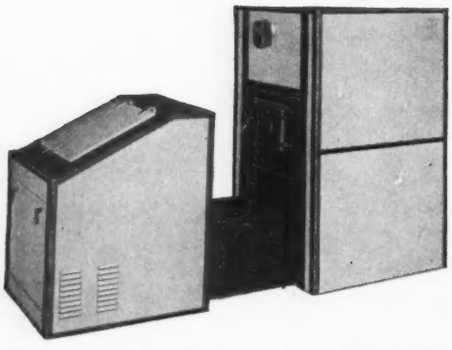
This analysis of the relation of the rate of feeding, the rate of air supply, and the depth of the fuel bed has shown that conditions tend to remain in equilibrium when air is supplied at a constant rate. The value of an automatic air control is easily seen, therefore. Without automatic air control, if a hole develops in the fuel bed from any cause, the resistance of the fuel bed is decreased and the rate of air supply from the fan increases. This tends to aggravate the hole and make conditions worse. Likewise, if the fuel-bed resistance increases, the air is decreased, the rate of burning decreases, the fuel bed becomes thicker and the condition is again further aggravated.

Holes in Fire Bed

When a hole develops in a fuel bed of a stoker equipped with a properly functioning air-control device, the air remains constant. Because of the hole, the CO_2 decreases, which means that the rate of burning decreases, but as the rate of feed is constant, the rate of feed will be greater than the rate of burning and the hole will be automatically corrected. Similarly, an increase in fuel-bed resistance will be automatically corrected.

For short "off" and "on" periods of the order of 10 min. each, the CO_2 content of the flue gases will generally be higher in the "off" than in the "on" period by 1 or 2 per cent, and some unburned combustible gases, carbon monoxide, hydrogen and methane are frequently found. These result from the continued evolu-

HESS AIR CONDITIONING STOKER FURNACE



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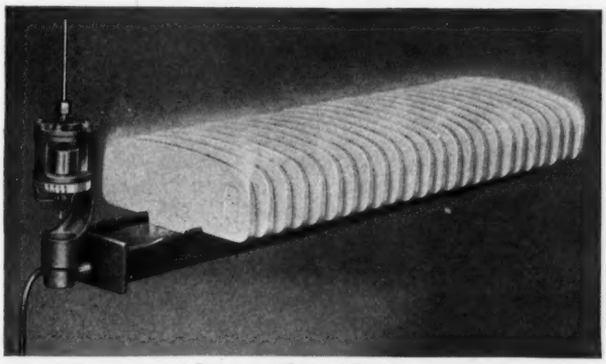

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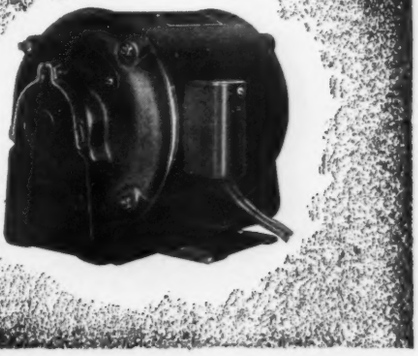

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The above are just a few of the many reasons why Wagner motors are preferred. Many motor buyers prefer Wagner motors because they know that the Wagner line is so diversified in types and ratings that they can get, without special designing, exactly the right motor for their job. Others prefer Wagner motors because they like the cooperation and helpful assistance the Wagner sales-engineers give them when solving their power-drive problems.

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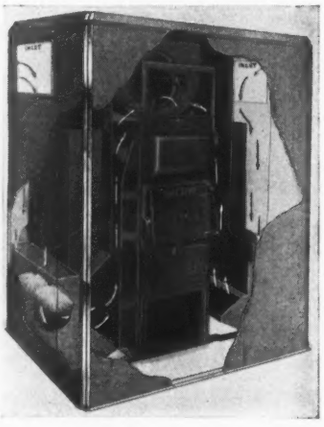

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tion of the volatile matter after the stoker shuts off; the small amount of air that enters by natural draft does not become well mixed with the combustible gases. During the "on" periods, the amount of unburned gases is negligible unless the air-coal ratio reaches small values, corresponding to 15 per cent CO_2 or more.

The rate of burning is so low in the "off" period that the loss of heat in unburned combustibles, based on the entire amount of fuel burned, is very low. Because of the difference in the gas composition and the difference in the rate of burning, the gas should always be sampled and analyzed separately for the "on" and "off" periods.

Summary

An attempt has been made to analyze the various reactions that occur in the combustion of bituminous coal on small underfeed stokers, including the feeding of coal to the retort, the process of carbonization, the combustion of the gases and the coke, the production of smoke and the disposal of the ash. The over-all relations between the rate of coal feed, the rate of air supply, the rate of combustion, and the depth of the fuel bed have been discussed.

The analysis has shown that the two principal characteristics of a coal that determine its performance on small stokers are its caking and coking tendencies and its size range, and that these are, for many and probably for most bituminous coals, closely related. Conditions are favorable to coke formation, as is shown by the fact that coals normally considered free burning form coke in the stoker fuel bed. Practically all coals, therefore, form coke trees, but even rather strong coke formations cause little or no real difficulty in properly designed combustion chambers. The objections to coke trees are frequently entirely unsound.

Coking Affected by Size

No sharp line of demarcation exists in the caking and coking characteristics, which divides suitable from nonsuitable coals for stokers. The caking and coking tendencies may generally be reduced by the adjustment of the size range, which may include either reduction of the top size or removal of the fines from the coal, or both, but with many coals this is entirely unnecessary. When it is desirable, the size for removal cannot be categorically defined; it remains as yet a problem for determination on each individual coal, although with increased knowledge a more general answer is to be expected.

This discussion of the process of combustion of bituminous coals in small underfed stokers has recognized that the fundamental principles of the stokers are the same. However, it is also recognized that changes in the design of retorts and tuyeres greatly influence the range of type and size of coal that can be successfully burned. Stokers are in a continual process of development and improvement. Originally it was thought that only the truly free-burning coals could be used but now a wide range of caking and coking coals is burned successfully. With a better understanding of the phenomena of caking and coking, it is probable that the design of retorts and tuyeres will be so modified as to make possible the successful use of even strongly caking coals.

(*Continued on page* 90)

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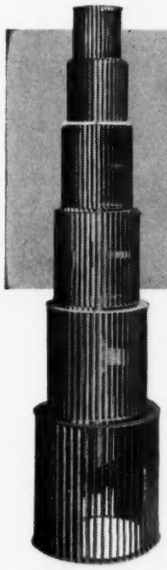

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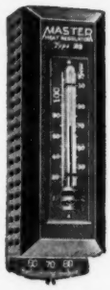

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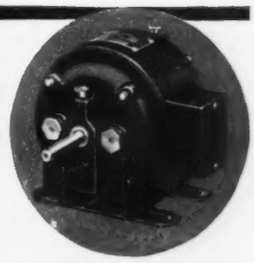

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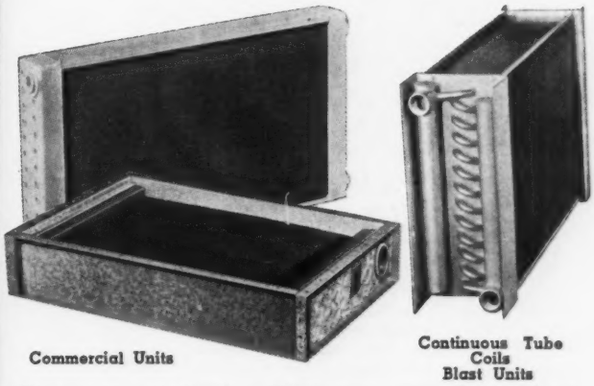

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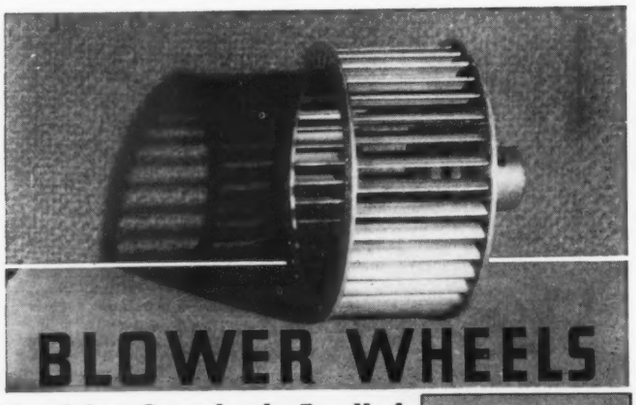

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Stoker Combustion

(*Continued from page* 88)

Acknowledgments

The experimental work from which the conclusions presented in this paper are drawn has been conducted by members of the staff of the Fuel Division of Battelle Memorial Institute, Howard R. Limbacher, Elmer White and Henry Ostborg.

The unfailing interest and helpful comments of the executives of Bituminous Coal Research, Inc.—John C. Cosgrove, President; Oliver J. Grimes, Secretary; H. N. Eavenson, Chairman of the Research Committee; J. B. Morrow, Chairman; John Fielding, Jr. and J. E. Tobey, of the Technical Advisory Committee—are gratefully acknowledged.

Research Activities

(*Continued from page* 76)

3—Investigation will also be conducted to find what constitutes a draft and how to avoid them; and of the scientifically correct amount of outside air which must be added to that circulating through buildings, a project made particularly necessary since many existing laws require wastefully large amounts.

4—The Society will continue co-operative work on fever-therapy, prevention of dust-borne diseases, and application of conditioning to hospitals and laboratories.

5—Study of heat-generating equipment and development of improvements of these and in heat conducting and heat radiating equipment, particularly for small houses.

6—Air conditions in relation to comfort.

7—Corrosion in heating and air conditioning systems.

8—Air distribution within an enclosure.

9—Frictional resistance to air flow through small ducts and fittings.

10—Heat transfer of finned tubes with forced air circulation.

11—Sound and its relationships to heating and ventilation.

12—Direct and indirect radiation performance with gravity air flow.

13—Practical limitations of air velocity and difference in temperature between room temperature and air delivery temperature in the use of unit ventilators in heating and ventilating schoolrooms.

14—Proper method and place of introduction of air for room cooling and the safe limits of difference in temperature between the room and incoming air.

15—Comparison of pressure losses in radius and square bends in ducts operating in conditioning systems.

16—Cooling homes by city water.

17—Solar radiation and its effects on heat and cooling requirements for buildings.

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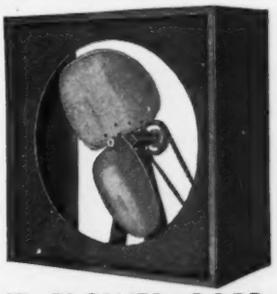

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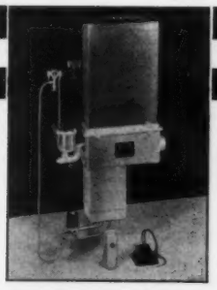

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THE **AUTOMATIC BUTLER** COAL STOKER

CONTINUES 400% SALES INCREASE PACE

Last year stoker sales increased 81%. Compare that to increases of 39% for oil burners and 28% for mechanical refrigerators. Consider well too the fact that last year sales of The AUTOMATIC BUTLER Coal Stoker were up nearly 400% over 1935.

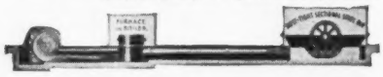
Get into this fastest growing of all business fields NOW. Get into it with the PACEMAKER, the MONEY MAKER. The AUTOMATIC BUTLER.

The line is complete. All models and sizes from 18 lb. per hr. to 1000 lb. per hr. capacities are highly engineered to handle a wider range of Automatic Heating at its best. Thousands are in use setting sales building performance records.

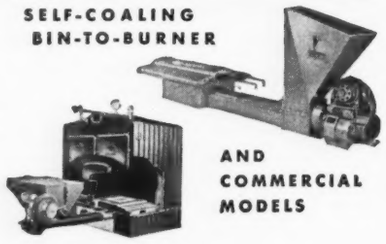
Automatic Butler dealer franchises are going fast. To see why check the advantages NOW before too late.

14 SIZES

STANDARD STREAMLINED



SELF-COALING BIN-TO-BURNER



AND COMMERCIAL MODELS

For complete data write direct to Stoker Division

BUTLER MANUFACTURING COMPANY

1273 EASTERN AVE., KANSAS CITY, MO.

uni-flo

GRILLES and REGISTERS

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ENGINEERED

AIR DISTRIBUTION

Do you use the best? UNI-FLO Grilles and Registers have been selected for many prominent heating, cooling, ventilating, and air conditioning installations because of exclusive construction and engineering features which give superior results. Get acquainted with UNI-FLO! Write for catalog and full information.

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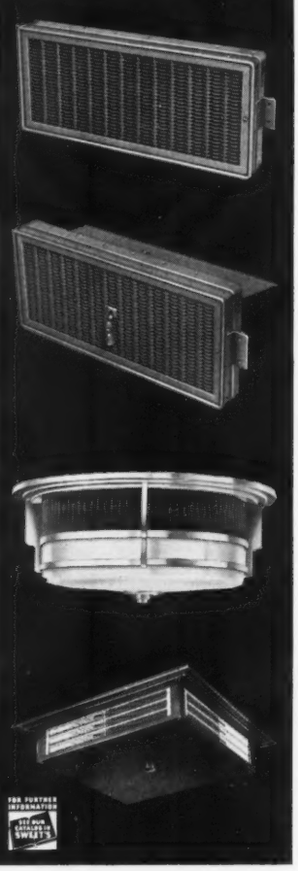
BARBER-COLMAN COMPANY

ROCKFORD, ILLINOIS



Michigan Convention

(*Continued from page* 34)

speaker declared that in his opinion the subcontractor will eventually be declared to have the same status as the general contractor, in other words, he becomes the ultimate consumer of materials, and the materials, when fabricated, become real property rather than the items to be taxed. Under rulings recently handed down by the Board and by the Attorney-General for the State of Michigan, many contractors are now entitled to a refund of tax moneys paid into the Board. The speaker explained the procedure which should be followed in submitting a request for such tax refund. In view of the fact that numerous contractors in Michigan are thus entitled to tax refund, many questions were asked from the floor dealing with specific conditions as outlined by the contractors. It was suggested that the Michigan contractors entitled to refunds under the provisions of these new rulings should submit their specific questions to Frank E. Ederle, secretary of the Michigan association.

• •

OFFICERS, 1937

President—James Hage, Flint.
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Treasurer—H. F. Brundage, Kalamazoo.

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Sergeant-at-Arms—E. Oberbeck, Rising & Nelson Slate Co., Detroit.

• •

Resistance Welding

(*Continued from page* 25)

greater for a given condition of current flow, electrodes, surface condition and pressure, so that in this case too much heat is developed at the desired point. This requires a reduction in voltage drop across the work pieces, which is accomplished by adjusting the heat regulator to a lower heat point.

In the thermal gradient of Fig. 3, only the instantaneous conditions were represented. The actual welding operation, however, requires a time interval, since power required (or heat generated in the weld) is the product of the current through the pieces, times voltage across the pieces, times time of current application, times factors for heat loss.

AEROFIN

Heat Exchange Surface

PROVED PERFORMANCE

FOR HEATING or COOLING

Write for Literature

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BLOWER WHEELS

Have established today's quality standard. Are unexcelled for smooth and quiet operation. Every wheel hand inspected and statically balanced. Lighter in weight than other wheels. Rugged, non-resonant, non-rusting. Lower starting torque. Less power consumption. Ratings available for all sizes. Bulletin gives data for housing scroll design.

AIR IMPELLERS SINCE 1885

The Torrington Mfg. Co.
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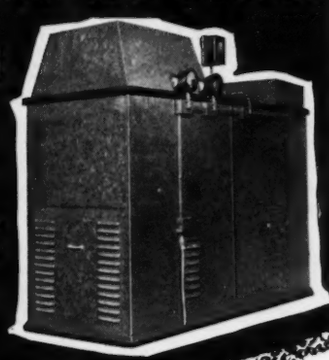
RUGGED
EFFICIENT
NON RUSTING
LIGHT WEIGHT
NON RESONANT
SMOOTH INLET RING
QUIET

COMFORT for the OWNERS and PROFITS for YOU

The BRADEN EVEREDY CONDITIONED WARM AIR FURNACE



We know you furnace men have been looking for a dependable year 'round air conditioning unit, and here it is. The BRADEN EVEREDY has everything needed for year 'round air conditioning in one economical, compact unit . . . and you'll sell the EVEREDY by merely *telling* the prospect of the following outstanding features . . . a burner of advanced design and unmatched performance . . . an efficient and positive air filtering device . . . automatically controlled spray-type humidifier . . . and a complete forced air circulation system. You can supply your customer with all these advanced features at the lowest price and still make yourself a handsome profit on each installation.

The BRADEN EVEREDY has been thoroughly proved by years of testing and you can take it on and push its sale with perfect confidence that it will produce for you.

Write us NOW for more information.

Oil Burner Builders, Inc.

BELLEVUE IOWA

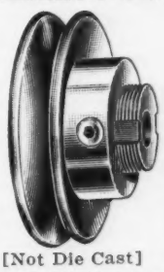
STOKER and BLOWER BUILDERS!!

You Can Insure Your Equipment Against Pulley Failure by Installing

MAUREY STEEL V-PULLEYS

Designed and built to stand up under the severest use, in Blowers and Stokers.

Made and carried in stock for both "A" and "B" section belts in a wide variety of sizes. These pulleys have heavy rolled edges and are made with solid steel or malleable iron hubs. **No die cast hubs are used in MAUREY PULLEYS.**



The MAUREY Variable Pitch Diameter Pulley

Made of SOLID STEEL—new construction. Permits a speed variation of as much as 30%. In four sizes, 3¼" to 4½" O. D.

[Not Die Cast]

MAUREY MANUFACTURING CORP.

Wabash at 29th Chicago, Ill.

Factors Affecting Fuel Savings

(*Continued from page* 61)

dium. The tests conducted at the Bureau of Mines* by Nichols and Augustine have indicated that the decrease in heat transmission and efficiency caused by the soot formation on heating surfaces was smaller than ordinarily believed to be the case, and much smaller than the decrease in thermal conductivity of soot alone.

Losses Due to Soot

The following excerpts are reprinted from the conclusions stated in the Bureau of Mines Report:

(1) The tests showed that in round, cast-iron boilers with three intermediate sections,—that is, a ratio of effective secondary to total heating surface of about 0.4—operated at the average rate for a heating season the insulating effect of deposits of soot decreased the heat absorbed by the boilers 2 to 7 per cent of the heat made available by the fuel, depending on the thickness of the deposit.

(2) The losses, expressed as a percentage of the coal burned, will be less and will be approximately proportional to the over-all efficiency. Thus, with 60 per cent efficiency, about 1¼ to 4¼ per cent of the coal will be wasted because of the insulating effect of the soot.

(5) These values do not include the waste of fuel that may result from incomplete combustion due to insufficient draft caused by the soot clogging the passages or flue, which may, and usually will be, much greater than the loss caused by the insulating effect.

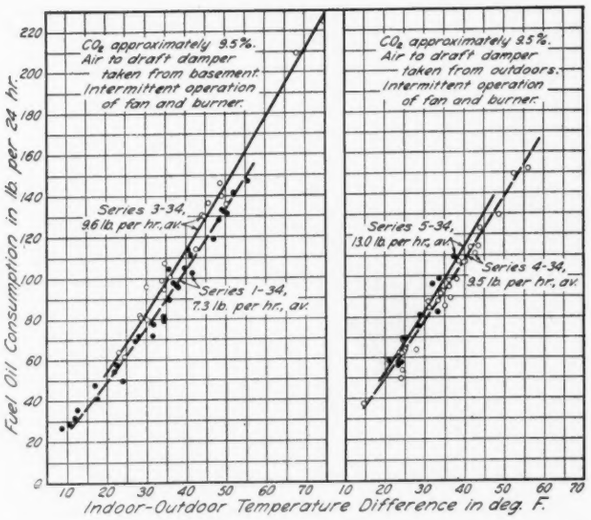
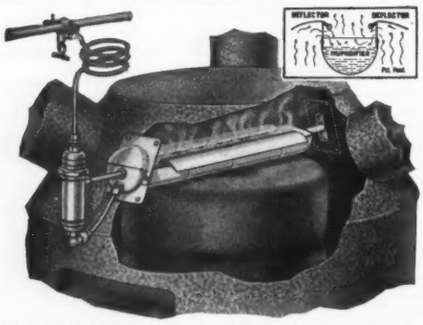

CO_2 approximately 9.5%. Air to draft damper taken from basement. Intermittent operation of fan and burner.
CO_2 approximately 9.5%. Air to draft damper taken from outdoors. Intermittent operation of fan and burner.
Series 3-34, 9.6 lb. per hr. av.
Series 1-34, 7.3 lb. per hr. av.
Series 5-34, 13.0 lb. per hr. av.
Series 4-34, 9.5 lb. per hr. av.
Fuel Oil Consumption in lb. per 24 hr.
Indoor-Outdoor Temperature Difference in deg. F.

Fig. 6—Daily Fuel Consumption Curves for Various Rates of Oil Input into Conversion Oil Furnace with Forced-Air Heating System

[To be concluded]

*See paper entitled, "Effect of Soot on Heat Transmission in Small Boilers," by P. N. Nichols and C. E. Augustine, U. S. Bureau of Mines Report of Investigations 3272, Feb., 1935.



The ZEPHYR Automatic Humidifier can be installed without removing furnace hood.
Adjustable overflow to reduce capacity to prevent over-saturation in zero weather.
Adjustable front hood plate. New type safety feeder located away from furnace heat to prevent corrosion.

The Heated Air Takes a Bath In the 1937 ZEPHYR HUMIDIFIER

The heated air can no longer dodge the humidifier. The patented wings of the Zephyr carry the air directly across the surface of the water. Highly efficient for either forced or gravity systems.

Pan stamped from GENUINE BRONZE SHEET which is about 10 TIMES AS EFFICIENT IN HEAT TRANSMISSION as cast or sheet iron. Unit comes complete as shown.

Also made in a twin unit for larger installations. Write for Circular 3-B for full details of this and other types of humidifiers and water line control valves.

MAID-O'-MIST, Inc.
180 N. Wacker Drive, Chicago, Ill.

THE
"ERWIN TYPE"
BACK DRAFT DAMPER

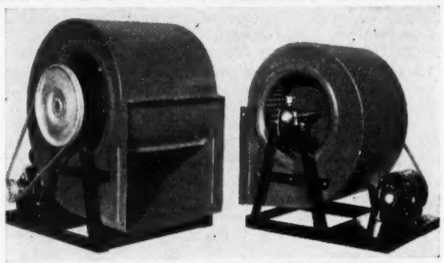
A dependable damper designed for installing inside enclosures such as duct work, allowing a maximum amount of air within a limited area to flow in one direction only.

These Back Draft Dampers are frequently employed in ducts leading from a central air conditioning plant in hospitals, colleges, schools and other large buildings to maintain an even temperature by preventing any back pressure or drafts caused when the plant is not operating.

Write us for further details on the complete ELGO line.

ELGO SHUTTER & MFG CO., DETROIT, MICH.

★ ★ ★ **ARTCRAFT** ★ ★ ★
HEAVY DUTY DOMESTIC BLOWERS



DEALERS: "BUY THE BEST"

CHICAGO STEEL FURNACE CO., write BLOWER DIVISION
7934 So. Chicago Ave. Chicago, Illinois

New Literature . . . .

For your convenience in obtaining copies of new Literature, use the coupon on page 116.

109—Modern Air Conditioning Unit

Agricola Furnace Company (Incorporated), Gadsden, Alabama, is distributing a small envelope stuffer illustrating and describing their Moderne air conditioning unit for winter and summer. This unit is made in three sizes, 68,000, 100,000 and 130,000 Btu. capacity.

◆

110—Parts and Accesories

Borg Warner Service Parts Company, 310 South Michigan Avenue, Chicago, is distributing 25,000 copies of a new 88-page automatic heating and winter air-conditioning parts catalog to dealers, contractors and service organizations throughout the country, according to an announcement by Ray P. Johnson, manager of the refrigeration and automatic heating department.

This company plans to render a definite service to the heating as well as the refrigeration industry in time and money saving, by enabling dealers to buy products used in the automatic heating and air conditioning business and of reputable manufacture at one source of supply.

◆

111—Seeks Co-operation of Builders and Utilities

Russell Electric Company, 340 West Huron Street, Chicago, is sending out a series of letters to consumers, architects and builders and utility companies, calling attention to the profits to be made by their co-operation in the promotion of the Hold-Heet system of home air conditioning. The Hold-Heet system may be used in conjunction with any furnace.

The consumer letter calls attention to the benefits and low cost of the night air cooling principle.

The letter of information for architects and builders reminds them that the Hold-Heet system provides summer cooling, year around air filtering, automatic temperature and humidity control, and forced heat delivery in winter at a price low enough to interest owners of old and builders of new homes, and invites them to pass along the good news to their customers.

The 4-page letter to utility companies calls attention to the fact that their co-operation will pay dividends from kilowatt sales.

◆

112—Aerocrat A. C. Equipment Catalog

W. R. Ames Company, 150 Hooper Street, San Francisco, California, manufacturers of air pipe and fittings, conductor pipe, eaves trough, cooler and residence ventilators, angle cap, ridge roll, mission and Spanish metal tile, steel roofing and siding, and shingle roofings, in addition to the Aerocrat blowers for warm air furnaces, exhausting and ventilating, and air-conditioning equipment including washing, filtering, humidifying, dehumidifying, cooling and heating, has just published a new catalog covering their Aerocrat air-conditioning equipment.

This catalog presents the complete new series of furnace blowers in a wide choice of sizes and arrangements. There are capacity tables, dimension tables and a new price list. Propeller fans, pent houses and automatic louvres, universal blowers and direct connected blowers have been added, with concise though complete information on fans and blowers for the smaller ventilating jobs.

Cooling units are illustrated and described, together with a diagram showing a complete year-round air-conditioning installation suitable for residential and light commercial jobs.

The catalog is intended as a reference book for heating, cooling and ventilating problems.

AUTOCRAT *Balanced Flame* OIL BURNERS

The Oil Burner That STAYS SOLD!

Endorsed by leaders in warm air heating

AUTOCRAT OIL BURNER CORP.
CEDAR RAPIDS, IOWA, U. S. A.

Now Ready—
the New PEERLESS CLEANAIRE BLOWER

Everything you want in a soundly-engineered blower, including price. Write at once for full details.

PEERLESS FOUNDRY CO., 1851 Ludlow Ave.
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Try this thermometer
ON 15 DAY TRIAL

• See for yourself how useful the Practical Recording Thermometer is. Engineers, servicemen, salesmen, dealers, contractors have adopted this thermometer for constant use. A Practical Recording Thermometer gives you dependable 24-hour temperature records. Completely portable, no connections, easy to handle. Pen and bi-metal element built into door, so they swing out of harm's way when chart is changed. Carrying case, 25 extra charts and bottle of ink furnished free. Don't delay any longer. Write today for 15 Day Trial Inspection offer.

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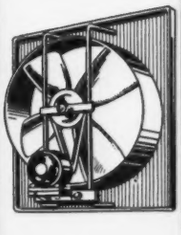
Dept. D, 2717 N. Ashland
Chicago

ASK YOUR JOBBER

PRACTICAL Recording Thermometer

INTERNATIONAL
FANS & SYSTEMS



Complete industrial line. Important installations in many fields. Full information on models, diameters, and capacities upon request.

INTERNATIONAL ENGINEERING, Inc.
DAYTON, OHIO

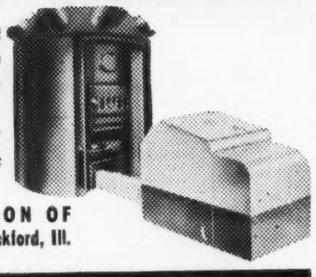
FAN SWITCH
by
GLEASON - AVERY

Fan switches made to the rigid GLEASON - AVERY specifications perform reliably for many heating seasons with little or no servicing. Install them to control the fan in forced warm air systems, or to stop overheating bonnets... In either case their performance will be completely satisfactory.

GLEASON - AVERY, INC.
AUBURN NEW YORK

ECONOCOL

Join the nation's fastest growing industry by lining up with ECONOCOL. It's the leader in *performance, low upkeep, appearance,* and *value*. Write today for details on profitable, exclusive dealer franchise.



ECONOCOL STOKER DIVISION OF
COTTA TRANSMISSION CORP., Rockford, Ill.

STOKERS

Count the **EXTRA YEARS**
. . . Not Dollars alone

Dollars of first cost are important, of course, when buying humidifiers, but extra years of service count most in the long run. THERMO-DRIP Humidifiers give users this premium . . . because all parts that come in contact with water are made of Stainless Steel or Monel Metal. It banishes rust and corrosion . . . protects your reputation for first class installations . . . assures uninterrupted performance for years. Let us send you further facts.

AUTOMATIC HUMIDIFIER CO.
18th and Main Streets CEDAR FALLS, IOWA

AN ALL PURPOSE AIR VELOCITY METER
ALNOR VELOMETER

Instantaneous-Direct Reading
No Timing
No Calculations
Write for Folder
ILLINOIS TESTING LABORATORIES, INC.
412 No. La Salle St. Chicago, Illinois

New Literature . . . .

For your convenience in obtaining copies of new Literature, use the coupon on page 116.

113—Installation Manuals

Schwitzer-Cummins Company, 1125 Massachusetts Avenue, Indianapolis, Indiana, has published installation manuals for their Stokolair and Hy-Duty blower-filter unit.

◆

114—French Air Conditioning Unit

French Rotary Oil Burner Co., Sebastopol, California, is distributing a leaflet illustrating the French oil burning hot air furnace equipped with a Model 9 French automatic Diesel oil burner. The leaflet also illustrates the Type F fan cabinet showing air filters, rubber mounted motor and drive.

◆

115—Heat Transfer Surfaces

Young Radiator Company, 709 Mead St., Racine, Wis., is distributing a 24-page catalog, illustrating and describing their heat transfer units, designed for either heating or cooling purposes using hot water or steam for heating; cold water or brine for cooling.

◆

116—"It's June in January"

The Thompson Mfg. Co., 30th & Larimer Sts., Denver, Colorado, is distributing a small envelope stuffer entitled "It's June in January with a Modern Hearth Furnace in Your Home."

Modern Hearth furnaces are built of heavy copper bearing boiler plate steel solidly welded into a gas-tight unit. An advantage claimed is the two-fuel feature, coal or gas. There are three capacities—60,000, 80,000 and 115,000 Btu. output.

◆

117—Aids for the Dealer

General Blower Company, 2402 Market St., Philadelphia, Pa., makers of heating and ventilating equipment at Vineland, N. J., is distributing an eight-page booklet setting forth the advantages of the G-B-C mechanical draft system. Space is provided for the imprint of G-B-C authorized dealers. Four-page mimeograph sheets are also available for the estimator with instructions as to how to determine the right type G-B-C automatic fire-tender to fulfil the individual requirements of any installation.

◆

118—Catalog No. 37

Hart & Cooley Manufacturing Co., 61 West Kinzie St., Chicago, is distributing Catalog 37 covering their line of warm air registers, air conditioning grilles and registers, and furnace accessories.

Containing 100 pages in a flat binding, this catalog is divided into three sections—Gravity Register Section, Air Conditioning Grille and Register Section, and Accessory Section.

The Gravity register section of fifty pages covers warm air registers, return air faces and intakes, floor register borders, ventilating faces, adjustable ceiling and sidewall ventilators, and ventilating register attachments.

The second section of 28 pages covers directional grilles and registers, adjustable deflection grilles and registers, bar-type grilles and registers, and perforated grilles and registers.

The accessory section illustrates and describes furnace and damper regulator sets, chain plates, warm air dampers, clips and tips, furnace chain, furnace pulleys, ball-bearing pulleys, casing clips and hooks, key rings, "s" hooks and spring snaps.

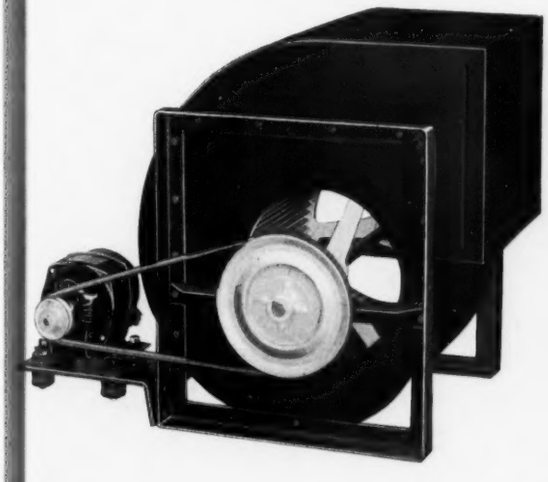
Six of the eight designs shown in the air conditioning section are new, as well as the damper regulator line.

From Now On IT'S HY-DUTY

Specify and Buy HY-DUTY BLOWERS

They're NO. 1 at any price

Available in Top Horizontal—Bottom Horizontal—Top Vertical and Bottom Vertical Discharge Outlets



SUPERIOR FEATURES OF HY-DUTY BLOWERS

- **UNUSUAL ECONOMY**
  Ample size—slow speed—efficient air delivery
- **HY-DUTY MULTI-BLADE BLOWER WHEELS**
  Forward curved blades—statically and dynamically balanced
- **HY-DUTY HOUSINGS**
  Heavy gauge steel throughout—welded seams
- **SELF-ALIGNING, SELF-OILING HY-DUTY PILLOW BLOCKS**
- **HEAVY STEEL MOUNTING BRACKETS**
  For universal installation. Eliminate distortion and vibration

Superior AT EVERY POINT

- PERFORMANCE
- QUALITY
- ENGINEERING
- SELLING FEATURES
- PRICE

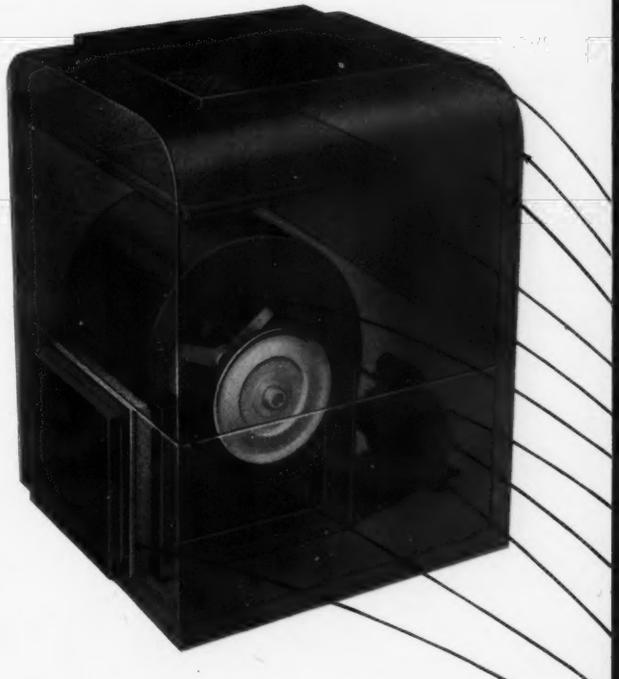
"Manufactured by Schwitzer-Cummins"

insures that the engineering is competent and advanced and that workmanship and materials are the very best.

For more than eighteen years the Schwitzer-Cummins Company have been suppliers of air-handling equipment to over 350 leading builders of engineering products whose specifications permit only the best, and are regular suppliers to the U. S. Government.

This is your assurance that whenever you recommend or buy HY-DUTY CONDITIONERS to go into your customers' homes, you have put your O. K. on the best there is in performance, reliability and simple and economical operation.

You can not afford to risk your profits or the good will of your customer-friends on anything less.



Hy-Duty Pillow Blocks and Blower Wheels available as separate equipment.

•

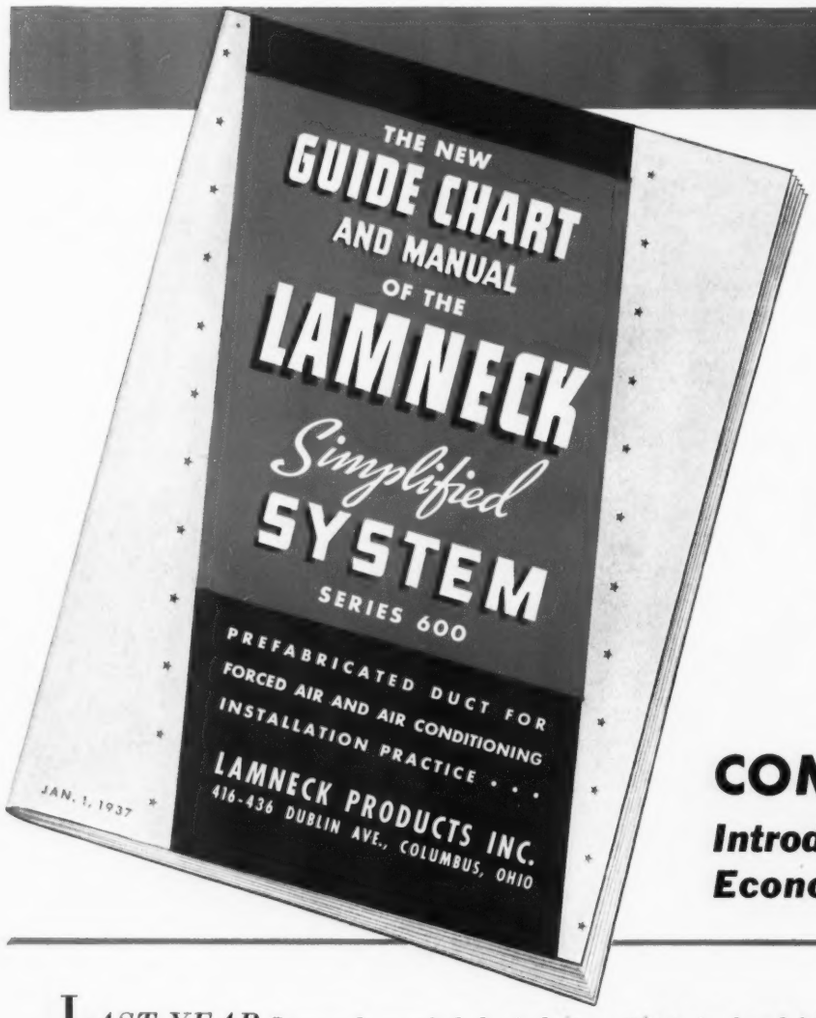
Write for prices and engineering information.

11 SUPERIOR FEATURES OF THE HY-DUTY BLOWER-FILTER UNIT

- Flanged Inlet.
- Modernistic Heavy Steel Cabinet.
- Large Access Door.
- 4 Filters.
- Perfect Filter Seal.
- 14" Diameter Hy-Duty Blower.
- Induction Motor with Automatic Overload Protection.
- Variable Speed Drive (Adjustable Over Entire Range on the Job).
- Full Floating Rubber Motor Mounting.
- Split Cabinet Construction, for Easy Installation (All Screws Concealed).
- Sponge Rubber Outlet Blower Seal.

MANUFACTURED BY THE BLOWER DIVISION OF

SCHWITZER-CUMMINS COMPANY



NOW READY!

LP INC

A NEW COMPLETE SYSTEM

Introducing New Styles, New Economies, Greater Profits

LAST YEAR Lamneck startled the industry by its presentation of the first Simplified Guide Chart. With its comprehensive offering of prefabricated duct and fittings for forced air and air conditioning it won instant acceptance as the solution to the industry's biggest problem.

Now Lamneck takes another important step forward with a new Simplified System, known technically as the 600 Series.

The new system is so complete and compact, yet so amazingly flexible and simple that our engineers challenge the industry to produce an installation problem or situation that cannot be solved with the 600 Series.

As against 2000 items in the old 500 Series, the new system is standardized to include only 350 items, which are so interchangeable and so ingenious in assembly that the dealer with ease can take care of any requirements without time wasting and expensive hand-fabrication. Also he can determine accurately beforehand his profits and forestall losses.

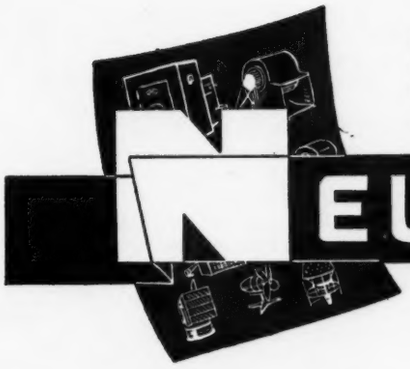
The compactness of the system offers a special advantage to the jobber because in much less space he can carry the complete stock necessary to give maximum service to his trade.

We offer the 600 Series with complete confidence. It has been fully approved by the keymen of the industry for its styling, its flexibility, its economy and its thorough dependability.

We are all ready for prompt delivery at big savings plus *Lamneck quality*. Get the new Guide Chart and Manual and enjoy new economies and greater profits. Ask for as many copies as you want. No charge or obligation.

LAMNECK PRODUCTS, INC.
414 DUBLIN AVENUE • COLUMBUS, OHIO

PREFABRICATED DUCT AND FITTINGS FOR FORCED AIR AND AIR CONDITIONING SYSTEMS



For your convenience a number has been assigned each item. Check the items in which you are interested on the coupon on page 116 and mail to us. Complete information will be forwarded.

● Indicates product not listed in 1936 Directory

△ Indicates product and manufacturer not listed in 1937 Directory

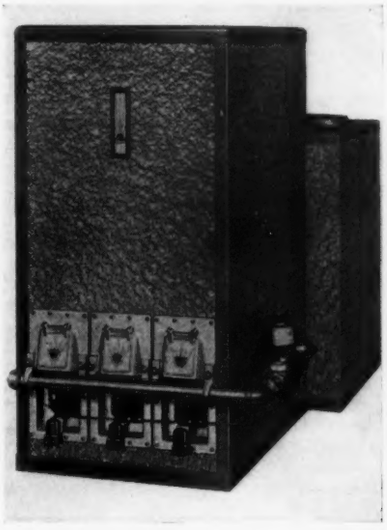
NEW PRODUCTS

22—Gas-Fired Air Conditioner

The Fox Furnace Company, Elyria, Ohio, announces the series "M," a new gas fired air conditioning unit with steel heating element.

The outer casing is finished in green crystalline enamel with a contrasting trim of dark green glossy enamel.

Each steel heating element is made of two sections which are welded together to a seamless unit.



This series has an unusually high efficiency, according to the Fox Furnace officials, who state also that the price of the new product is substantially lower than that of their Sunbeam units with cast iron heating elements.

Space saving compactness is one of the features of the series "M" which fits into limited areas.

◆

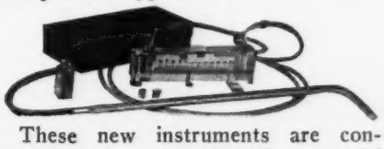
● 23—Thermo-Tector

General Electric Co., Schenectady, N. Y., has recently placed on the market a new thermal overload switch for fractional horsepower motors, operating on line current and arranged for convenient mounting on the conduit or terminal box of the motor. It is completely self-contained.

Known as the "thermo-tector," the device automatically disconnects the motor from the line, when an overload occurs, before the motor reaches a dangerous temperature. Then, when the motor has cooled, it is automatically reconnected to the line.

24—Air-Meters—Pitot Static Heads

Julien P. Friez & Sons, Inc., Baltimore, Maryland, announce a new range of air meters, draft gauges, and air filter gauges, which incorporate several new advantages as well as a new pitot static head for use with the portable types.



These new instruments are constructed of a clear Bakelite material and they are rugged, sensitive, and reliable. They are provided with accurate, quick, and easy means for leveling before taking readings. The portable instrument is contained in a handsome carrying case.

Various types and ranges are available covering velocities as low as 400 feet per minute and as high as 8,000 feet per minute, or vacuums or pressures as low as .005 in. of water up to 4 in. of water.

A unique feature is the chromium plated and highly polished graduated scale which is carried on the back of the instrument and viewed through the transparent Bakelite.

A new Friez Pitot static head is also announced for use either with the new Friez instrument described above, or for use with other instruments designed for similar purposes. This new Pitot static head is of correct theoretical design, accurately machined, and in such a form that it is easily used for giving exceptionally accurate readings, especially with the new Friez air meters and draft gauges. Since an opening only ½ in. in diameter is required into ducts, housings, etc., for the insertion of this Pitot static head, accurate velocity readings are obtained where an anemometer could not be utilized with satisfaction.

◆

● 25—Emergency Pipe Clamps

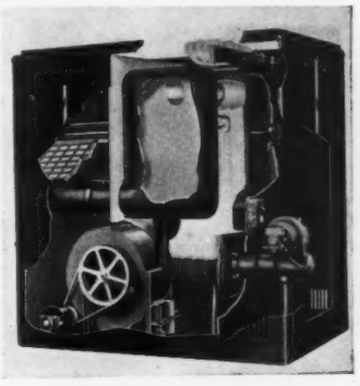
M. B. Skinner Co., 3770 W. Sample street, South Bend, Indiana, offers easily applied clamps for permanently stopping leaks in pipes carrying air, gases, heavy or light liquids, solutions. The makers say every clamp is tested under a pressure of 3,000 pounds before it leaves the factory.

26—New Rudy Line

The Rudy Furnace Company of Dowagiac, Michigan, enters 1937 with a completely new line of coal, oil and gas heat air conditioning furnaces backed by a 25-year guarantee.

New Rudy exteriors carry out the modern trend toward simplicity and are finished in what Rudy calls "Satinkrack," a black, baked enamel process that produces an attractive, semi-lustrous effect. Trim is stainless steel. The oil heat air conditioners are designed in two distinctive types. The Rudy "200" with a Btu output capacity of 160,000 per hour consists of two units, the heating and humidifying unit, and the ventilating and air-filtering unit. The "125" with a Btu output capacity of 100,000 per hour is a complete, compact single unit system.

The 1937 Rudy gas heat air conditioner is designed to occupy minimum space and consists of five major assemblies: the cast iron furnace, the burner mechanism, the humidifier, the ventilating element, and the filters.



The burner mechanism features a Rudy patented automatic "shut-off" valve.

The Rudy coal heat air conditioner is notable because of its generous proportions, its full throated radiator with heat-holding dome, and the new smoke burners.

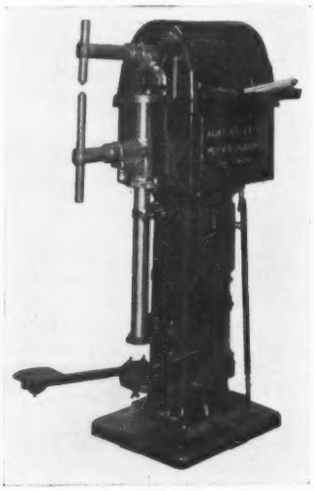
Tied into the 1937 program of the company is a winter delayed-payment plan under which dealers can offer their prospects the privilege of installing Rudy furnaces or air conditioners during March or April without payment until May 15.

New Products . . . . . .

For your convenience in obtaining information regarding these items, use the coupon on page 116

27—Hot Spot Welders

Acme Electric Welder Company, 5621 Pacific Boulevard, Huntington Park, California, manufacturers of spot welding equipment, announces its new line of Acme "Hot Spot" welders for 1937. Incorporating most of the former distinctive features, the



new line embodies a clamping block device for holding the double end reversible horns rigidly in any desired position by a quarter turn of a sturdy clamp screw, yet marring or cutting the copper surfaces is eliminated. The new postive lock heat regulator cannot be jarred from its perfectly aligned position; a simple pull of the knob instantly frees the handle for quickly changing from one heat to another. All working parts are either of malleable iron or steel, and the company continues its policy of a lifetime guarantee against defects in material or workmanship. A complete range of sizes is available.

◆

28—New Oil Burner

Syncro-Flame, 1900 Park St., Hartford, Connecticut, announces a new oil burner into the low price field. The new Econ-O-Miser has all moving parts — motor, fan, pump, and pressure regulating valve—incorporated in a single unit which can be removed from the burner by removing the few screws that secure the housing cover.

The burner housing base is a single casting. A breach plate at the back of the burner affords easy access to nozzle and electrodes, while the larger junction box, an integral part of the housing base, simplifies the making of electrical connections.

The capacity of this burner is from one to three gallons per hour.

29—New Progress in Oil Heating

Columbus Metal Products, Inc., Automatic Heating Division, Columbus, Ohio, is distributing a 16-page, 9x12, booklet entitled "New Progress in Oil Heating" illustrating and describing the Donmore oil burner unit —a new type of burner which they claim offers distinct advantages for use with those products in the heating field which require under 135,000 B. t. u. of heat per hour for their operation.

Donmore oil burners provide two stages of fire—a low or standby fire which operates entirely with natural draft, and a high or peak fire, operating with forced draft.

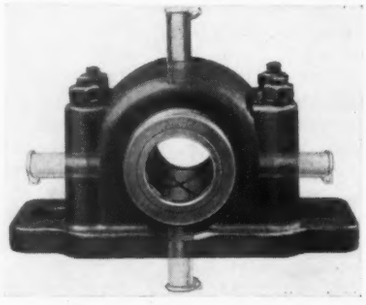
The Donmore oil burner employs the principle of "hydroxilation," which means that it does not burn oil as oil, but converts it into a clean, ready burning gas a fraction of a second ahead of the time that visible combustion takes place.

◆

30—Universal Pillow Block

The Randall Graphite Products Corp., 609 West Lake Street, Chicago, has developed a Universal-type double reservoir oil return pillow block that can be mounted in any position, according to the requirements of each individual installation.

With the Universal pillow block, it is necessary only to select the mounting position needed, unscrew the oil



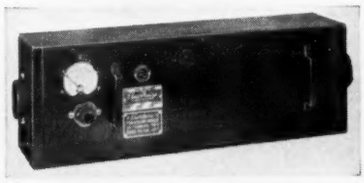
cup, turn the ball to this position and reinsert the oil cup vertically.

The Universal double reservoir oil return pillow block has two large reservoirs in the spherical ball. A supply of oil is placed in the upper one which feeds the shaft as needed through graphite feed plugs and graphite pressure-packed channels. Oil recovery grooves divert unconsumed oil into the lower wool-packed reservoir. This oil is again fed to the shaft and bearing through lower graphite feed plugs.

The Universal bearing is self-aligning and is precision bored on Ex-Cell-O equipment to close tolerances.

● 31—Ozone Generator for Ducts

Electroaire Corporation, 1455 West Congress St., Chicago, Illinois, has developed a new type of ozone generator, to be attached to any air duct, and thus ozonate the air going into a single room or section of the building. Heretofore, there were two types of units—one for installation in connection with a central heating, ventilating or air-conditioning plant; the



other, a portable type, which could be carried wherever desired and plugged into an electric light circuit.

Air enters at the right end of the unit, is ozonated as it passes through, and is discharged into the duct at the left for distribution. As on both central plant and portable models, this unit is also equipped with a rheostat and meter for regulated ozone generation.

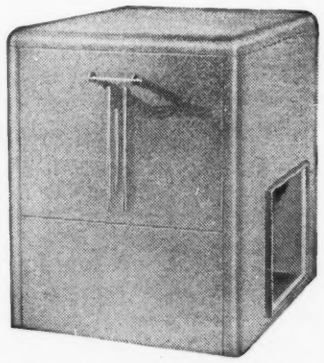
This unit makes possible a permanent installation for ozonating air in ducts serving only a part of a building, where heretofore nothing could be used except portable models.

The JR Model is manufactured in three sizes having respective capacities of 3,000, 4,000 and 5,000 C.F.M.

◆

32—Package Unit Furnace Blower

Lau Blower Company, Dayton, Ohio, 954 E. Monument Ave., presents a new 1937 package unit furnace blower—Series 700—said to overcome all objectional installation and opera-



tion obstacles. This new knock-down package unit blower is made in twelve sizes to meet all requirements, with Morocco finish and chrome trim. All units, they say, are tested in exact accordance with the ASH&VE blower test code.

The unit is complete with furnacestat, motor, filters, blower cabinet, variable speed drive, blower and two access doors.

New Products . . . . . .

For your convenience in obtaining information regarding these items, use the coupon on page 116

33—Scroll Pivoter Snip

J. Wiss & Sons Company, Newark, N. J., has developed and placed on the market a newly designed metal cutting tool, under the trade name of 9X "Scroll Pivoter" snip.

This shear, because its patented design gives it the ability to pivot as it cuts, allows the user to easily follow curves and angles in cutting and trimming and in producing designs, not possible with the conventional straight or curved snip. Attention has also been given in its design to provide the

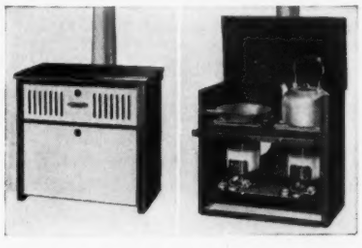
maximum protection to the fingers and hand of the user to prevent risk of cutting or scratching by the metal. The patent hand-grip, which consists of a ring for the fore-finger as well as a loop found on all heavy-duty snips to accommodate most of the hand, serves the double purpose of giving better direction to the cut and greater protection to the fingers.

The cutting edges of the blades are ground to 1/1000 of an inch.

◆

• 34—Camp-Trailer Stove

Perfection Stove Company, Cleveland, has developed a kerosene-burning "heat or cook" stove designed especially for use in cabin trailers, but useful also for other purposes, such

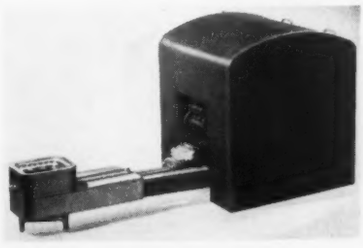


as camps and kitchenettes, where a compact stove is required. It is a dual-purpose stove, to be used for both cooking and heating, equipped with two high-power burners which are said to be "as fast as gas."

The stove is 21⅛ inches high, 24¼ inches wide, and 16 inches deep.

35—Norge Stoker

Norge Heating and Conditioning Division, Borg-Warner Corporation, Detroit, manufacturers of automatic heating and air conditioning equipment, are now producing domestic sto-



kers. A separate unit of the parent company, this division markets a line of heating equipment including Whirlator oil burners, gas burners, boiler burner units, Fine-Air conditioning furnaces, space heaters, oil burning water heaters and domestic coal stokers.

Two stoker models are featured, one designed for homes with seven rooms or less, one for larger residences. Precision gears of chrome nickel steel built by Borg-Warner are featured in Norge stokers. The master control eliminates possibility of overheating, and the pilot fire control keeps a very small fire in mild weather.

◆

36—Stoker Control Timer

The Spencer Thermostat Company of Attleboro, Mass., has just announced a new Klixon Timer for automatic stokers. With the new timer it is possible to have flexible control for maintaining fires. The timer can be set to turn the heat on at in-

tervals ranging from one-half hour to one hour, and it can also be set to keep the heat on any length of time ranging from two minutes to seven minutes. These settings are entirely independent of each other.

Another feature claimed is a device for preventing the timer from going on if the thermostat has been calling for heat and the fire has been built up. The timer remains idle when the thermostat is functioning.

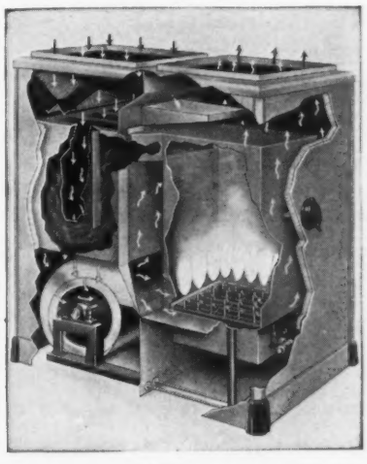
37—New Humidifier

Southworth Machine Company, 30 Warren Ave., Portland, Maine, is distributing a 4-page folder, illustrating and describing their new Model D Humidifier—a disc type machine. The water passes through a sensitive control mounted on each unit and is delivered to a disc which revolves at high speed. This disc is mounted on a shaft which is supported by ball bearings located in the casing. Near the outer rim of the bowl, the grid or break-up teeth are positioned.

◆

38—S-N 1937 AC Furnace

Scott-Newcomb, Inc., 1922 Pine Street, St. Louis, Missouri, announce the 1937 S-N air conditioner for gas burning, although they say it can also be arranged for oil burning or for a stoker. These conditioners are made in three sizes—100,000, 200,000 and 400,000 Btu output.



The case is finished in three colors —black base, with two tones of green. Octagon corners are used, the top carries a bevel edge and projects slightly over the edges of the case and corners.

The contra-flow heat principle, as in the past, is used. The products of combustion pass upward in the combustion chamber and then downward through a part of the economizer section and upward to the top of the economizer section, and out to the flue. The cool return air coming from the rooms, comes through the air filters and down over the economizer section.

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Time Per Job Reduced 70% Over Estimate.
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Cuts up to 16 gauge hot rolled steel, speed as you feed. Other materials in proportion. Other portable Unishears with capacity up to 14 gauge, stationary Unishears with capacity up to ¼" boiler plate.

● **That's what happened when Stanley Unishear—"The Electrically Driven Hand Shear" replaced hand-cutting methods at a Philadelphia manufacturing plant.**

● **Used to remove a scribed section of 18 gauge Stainless Steel to permit installation of a sink, Unishears do the work three times as fast—save valuable material and do better work.**

● **Your job may call for cutting 14 gauge or 16 gauge instead of 18 gauge steel. For duct work, bus bodies, electric signs, kitchen equipment. There is a Unishear made to handle every job faster and better. Cutting any pattern with hairline accuracy, without distortion of metal, Unishears make a place for themselves wherever sheet materials are cut. Ask your Stanley distributor for a demonstration, or write Stanley Electric Tool Div., The Stanley Works, 131 Elm St., New Britain, Conn.**

STANLEY UNISHEARS
THE ELECTRICALLY DRIVEN HAND SHEARS

Association Activities . .

NWAH&ACA

In General Bulletin No. 31, dated February 1, the National Warm Air Heating and Air Conditioning Association calls attention to the June convention as the next big event in the industry.

Dates—June 8, 9 and 10.

Place—Hotel Cleveland, Cleveland, Ohio.

The officers promise a practical and helpful program and the managing director invites suggestions and recommendations as to speakers and subjects.

The Cleveland Committee consists of Harold S. Sharp, chairman, E. C. Fox, George G. Auer, Walter Seelbach and R. A. Jack.

Allen W. Williams, Managing Director and Treasurer.

◆

Philadelphia

At the fifty-first annual banquet of the Hardware Merchants & Manufacturers Association of Philadelphia, the jury of award presented Dennis A. Merriman of Chicago—vice-president, director and general sales manager of the American Steel & Wire Company—with the gold medal and scroll annually awarded to an outstanding individual connected with the industry who has reflected great credit upon it.

George A. Fernley, Secretary-Treasurer.

◆

The National Wholesale Hardware Association, 505 Arch Street, Philadelphia, announces with deep sorrow the death of Frank J. McNeive, general manager of W. F. Potts, Son & Company, Philadelphia, vice-president of the association, and chairman of the Galvanized and Black Sheet & Corrugated Roofing Committee.

◆

Buffalo

The Buffalo Sheet Metal, Warm Air Heating and Air Conditioning Association is holding its air conditioning school, one of the most interesting ever to be put before the heating contractors in Buffalo and Western New York. Members of this school come from Niagara Falls, Batavia,

Cheektawoga, Marilla, Angola, Hamburg and other towns.

Charles H. Lighthart of the Furblo Blower Company is the heating engineer instructor.

Each member is furnished with books, plans and literature lessons on how to figure the B. T. U. method, register sizes, furnace and blower sizes, layout of duct system, thermostats, humidifiers, etc.

The attendance is so large that members have been turned away. This school starts promptly at 8 o'clock and closes at 10 o'clock.

At the December 2 meeting of the Buffalo Sheet Metal, Warm Air Heating and Air Conditioning Association, held at Crescent Hall, corner East Utica and Verplank Streets, Buffalo, a motion was passed to appoint a committee to contact the municipal authorities relative to a warm air heating and air conditioning code. Messrs. Olear, Cunningham and McBride comprise the committee.

At the January meeting Leo J. Olear of Charles P. Olear & Sons was again elected president of the association.

Milwaukee

1937 Officers of the Master Sheet Metal, Heating, Ventilating and Air Conditioning Contractors Association of Milwaukee, Wisconsin, are: President, A. A. Walters; vice-president, F. Kramer; secretary, W. A. Schmidt; treasurer, Walter Marth; executive secretary, Paul L. Biersach.

The board of directors for 1937: A. A. Walters, Frank Kramer, Walter A. Schmidt, Walter March, A. C. Goethel, E. F. Arndt, R. H. Fetting, John Goodwin and Adolph Schumann.

Paul L. Biersach, Secretary

◆

Cleveland

At a regular meeting of the Sheet Metal Employers Associations, Inc., the following officers were elected: Milton Thesmacher, president; H. H. Pennell, vice-president; M. J. Cutter, secretary and treasurer.

Directors are W. E. Feiten, D. A. Mannen, J. Halter, A. Frank and M. J. Cutter.

On the apprentice committee are W. E. Feiten, M. Thesmacher and M. J. Cutter.

M. J. Cutter, secretary.

◆

Ohio

The program of the Ohio State Metal Contractors' Annual Convention, to be held at the Carter Hotel, Cleveland, March 16, 17 and 18, 1937, is completed.

The entertainment committee urges attendance Tuesday. There will be registration at 11 a. m. and a meeting of the state directors at 2 p. m. The ladies "Get Acquainted" tea is from 3 to 5 p. m. At 8 p. m. the convention opens in the Rainbow room with five amateur boxing and wrestling matches, singers, dancers, punch bowl and buffet supper, with gypsy music, but no dancing.

The Ohio Convention Committee

BOTTOM ROW: (Left to right)—Art Buell, Entertainment Committee; Wm. E. Feiten, Chairman, Convention Committee; D. A. Mannen, Chairman of Program Committee; Milton Thesmacher, Chairman of Entertainment Committee; M. J. Cutter, Secretary and Treasurer.

TOP ROW: Joe Hagan, Chairman of Finance Committee; R. A. Jack, Publicity Committee; C. Moseley, Chairman of Publicity Committee; Geo. Halter, Publicity Committee; C. Springer, Program Committee; Art Franck, Program Committee.

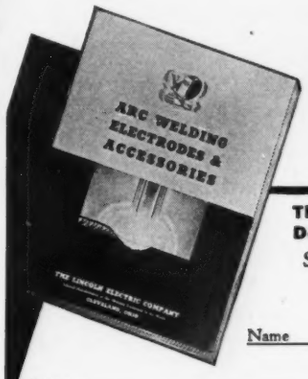
On Wednesday the convention opens at 9:30 a. m., with qualified speakers on workmen's compensation, the social security act, air conditioning, the new mechanical heat code and the business outlook. A banquet is planned for 7 p. m. with Dr. John L. Davis, a humorist of national reputation, as the after-dinner speaker. Entertainment is a complete Nite Club Show—a ten-piece orchestra, 5 acts of girls, music, singing, hoofing and an informal dance.

Thursday winds up the session with business reports, elections, etc.

M. A. Thesmacher, Chairman Entertainment.

A VARIETY of metals and alloys are encountered in the everyday work of today's "tin" shops. To be able to weld them all satisfactorily and economically, greatly simplifies many a job and makes welding facilities pay for themselves in no time at all.

Here is a guide which gives the arc welding procedure for every essential problem in sheet metal fabrication. Your shop is not complete without it. To get a free copy, simply mail the coupon or write to the address below.



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INTRODUCING THE NEW SLOW-SPEED HIGH TORQUE SKILSAW ELECTRIC DRILLS

MODEL 44
¼ in. DRILL
Capacity in steel ¼ in., in wood ¾ in.; length overall 14 in.; weight 6½ lbs.; standard speed 750 R.P.M. (350 - 450 - 600 optional); ball bearing construction. **$36**

MODEL 84
½ in. DRILL
Capacity in steel ½ in., in wood 1¼ in., length overall 14½ in.; weight 8 lbs.; standard speed 350 R.P.M. (450-600-750 optional); ball bearing construction. **$48**

BUILT especially for drilling in steels of high nickel content, such as Monel and Allegheny metals, stainless steel, etc. Both models available in speeds of 350, 450, 600 and 750 R.P.M.—can't be stalled even at maximum drilling speed!

These new SLOW-SPEED Skilsaw Drills lengthen the life of twist-drills, eliminating the need for frequent sharpening. The ½ in. model is new in design for a drill of this capacity. Its one-hand grip feature makes it ideal for close quarter work and for use with hole saws in places impossible to reach with side-handle drills. Both models are especially adaptable to wood boring.

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With the Manufacturers . .

Ed. B. Root with Dailaire

Dail Steel Products Company, Lansing, Michigan, announces the appointment of Ed. B. Root as heating engineer for Mid-west states. Mr. Root has been associated with the heating industry for the past 15 years and has held an enviable reputation in engineering circles. He is active in various associations, the more prominent of which are American Society of Heating and Ventilating Engineers and National Warm Air Heating and Air Conditioning Association.

◆

William Hogarth Hill

William Hogarth Hill, 69 years old, vice-president and director of American Radiator Company and chairman of the board of The Fox Furnace Company, an affiliate of the former in the American Radiator and Standard Sanitary Corporation, died Friday morning, January 29, from a heart attack, immediately after he arrived at his office at 40 West 40th Street, New York City.

◆

Lyman, International Heater, Dies

Clarence M. Lyman, 77, of New Hartford, New York, former sales manager of International Heater Company, Utica, New York, died unexpectedly at his home February 28, 1937.

Mr. Lyman was a charter member of the National Warm Air Heating & Air Conditioning Association and chairman of its Code Committee for many years. He served first as active chairman and then as honorary chairman for a number of years.

◆

Lincoln Arc Welding Foundation and Award

Dedicated to encouragement of study and research for benefit of the arc welding industry, a significant new Foundation has just been established by vote of The Lincoln Electric Company's directors.

This new fund has been named "The James F. Lincoln Arc Welding Foundation," in honor of the pioneer work of the company's president in promoting arc welding and in perfecting and developing arc welding equipment and electrodes.

Principal direction of the Foundation's work will be given by Dr. E. E. Dreese, head of the Department of Electrical Engineering at the Ohio State University. Other trustees are W. B. Stewart, distinguished member of the Cleveland Bar, and H. R. Harris, Vice President of the Central National Bank of Cleveland.

To stimulate intensive study of arc welding, $200,000 will be distributed by the James F. Lincoln Arc Welding Foundation among winners of 446 separate prizes for papers dealing with this subject as a primary process of manufacture, fabrication or construction in eleven major divisions of industry.

The principal prize winner will receive not less than $13,700. Other prizes range from $7,500 to $100—the latter sum to be awarded each of 178 contestants who receive no other prize, but whose papers are adjudged worthy of honorable mention.

General Rules and Conditions may be obtained from Foundation Secretary A. F. Davis, P. O. Box 5728, Cleveland.

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Easy operation, accurate work, adjustable for sharp or rounded bends, completely equipped with gages and stops for narrow or wide bends at desired angles, clamps and folds in one operation, 17" to 60" working lengths, 22 gage capacity.

Power Drive Available

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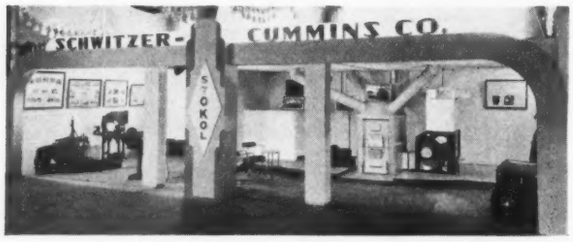
NIAGARA

With The Manufacturers . .



Attractive Home-Show Exhibit

Schwitzer-Cummins Company, 1125 Massachusetts Ave., Indianapolis, Ind., manufacturers of Stokol stokers, and Stokolair blower filter unit, had this attractive exhibit at a recent home show in Indianapolis.

◆

A. U. Steenrod Manager Milcor, Canton Plant

A. U. Steenrod is the manager of the Canton plant of the Milcor Steel Company, according to announcement made by Louis Kuehn, president.

For seven years Mr. Steenrod was in charge of Milcor's Chicago plant, having joined the company in the fall of 1929.

◆

Farris Joins Emerson

The Emerson Electric Mfg. Co., 1824 Washington Ave., St. Louis, Missouri, makers of motors, fans and appliances, announces the appointment of Eugene P. Farris as manager of specialty sales.

◆

Ellingson Joins Milwaukee Concern

W. J. Ellingson, formerly connected with the Furblo Company is traveling the state of Wisconsin for the Milwaukee Plumbing and Heating Supply Co., 715 W. Clybourn St., Milwaukee, representing their heating line.

Jenkins Named Vice President

Gar Wood Industries, Inc., Detroit, announces the appointment of Ralph S. Jenkins as a new vice president in charge of manufacturing of all its divisions.

◆

Sioux Steel Sponsors A. C. School

The Sioux Steel Co. of Sioux Falls, South Dakota, until recently known as the Sioux Falls Corrugating Company, sponsored a four-day air conditioning school at a local hotel February 22, 23, 24, and 25.

Eighty-two of the most representative dealers from South Dakota, western Minnesota and western Iowa attended this first air conditioning school to be held in Sioux Falls.

◆

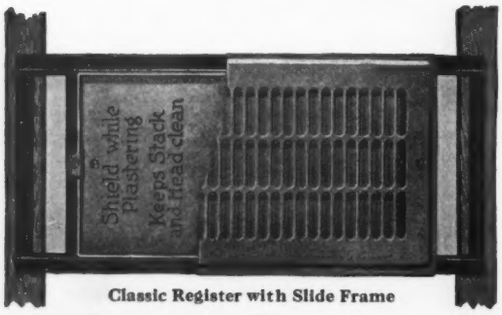
Lennox Dealer School

The Lennox Furnace Co., Marshalltown, Iowa, held a four-day dealer convention and engineering school in Marshalltown recently. More than 400 dealers attended. The

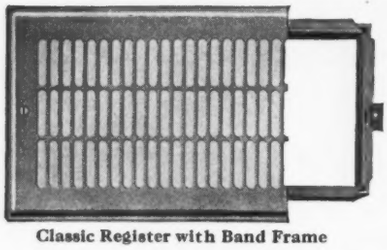
Lennox complete line—52 units—gravity, forced air and air conditioning—were on display. Some were operating.

A new model, the streamlined Torrid Zone Series 8, was shown publicly for the first time.

Use AUER Registers on Your Next "Fussy" Job!



Classic Register with Slide Frame



Classic Register with Band Frame

Detail of Double Frame from Back

● **You will like their special features for easy installation. Your "particular" customer will be pleased by their trim modern beauty, ample free circulation area, extra rugged construction, and *positive* blades that respond to finger-tip control. AUER makes a complete line of Registers and Grilles, in all desired types and finishes, for air conditioning or gravity jobs. Write for the AUER Register Book.**

THE AUER REGISTER COMPANY, 3608 PAYNE AVENUE, CLEVELAND, OHIO

AUER DISTINCTIVE REGISTERS & GRILLES For Air Conditioning *and* Gravity

5 REASONS WHY THE RYBOLT CAST IRON FURNACE LEADS THE FIELD

- **BEAUTY . . . . .** That's one of the present day "musts" a furnace must answer to. Homeowners who have decorated their basements do not want to install an unsightly heating plant to spoil the arrangement. It's a valuable selling point.
- **EFFICIENCY . . . . .** Nowhere can you find a furnace that can surpass the RYBOLT in downright heating efficiency. Plenty of healthful heat with a minimum of effort and expense.
- **STRENGTH . . . . .** The toughest winters hold no terrors for this furnace. It takes 'em all in stride and does so year after year with little or no attention to add expense and inconvenience to the owner.
- **PRICE . . . . .** For all its expensive construction and unparalleled performance the RYBOLT does not cost any more than cheaper plants of its size and rating. Your prospect will get a peasant surprise when you figure jobs with a RYBOLT.
- **QUALITY . . . . .** This is the last point but far from the least. Back of every RYBOLT 5 Point Cast Iron furnace lies over a quarter of a century of diligent research and experiment. You can be sure that the RYBOLT will back up any and all claims to the homeowner.

Furnace men all over the country know the RYBOLT name and reputation. They know that there is no compromise in RYBOLT construction . . . that every plant will perform exactly as they expect . . . and that the RYBOLT name on any furnace means QUALITY plus.

Take advantage of the many new installation and repair jobs in your neighborhood to make some extra money in the future. Install the RYBOLT on the new jobs and sell it on those hopeless repair jobs.

Write us today for full information.

THE RYBOLT HEATER COMPANY
ASHLAND OHIO

They Did Make the Money, And Say You Will Too . . .

- **"Cleaned 360 jobs last year. Those cleanings sold 5 new plants, 10 re-set jobs, 4 new grates, 50 new smoke pipes, 5 new fire pots."**
- **"200 cleanings. Average cleaning charge $5.00 each. Sold 10 new fire pots, 15 re-sets, 15 new grates, 20 new smoke pipes, 5 new plants."**
- **"Cleaned 300 jobs. Average charge $3.00 each. Made 50 new customers."**
- **"20% of our cleanings bring in other work."**

THE above are from recent letters by men in your business—average shops. Names on request—and names of scores of others who made more money last year, because they bought Supers and went after cleaning jobs. They say it's easy to sell cleanings—and after the cleanings easy to sell new plants and repairs, on up to air conditioning.

And Super users make good money on cleanings alone. Average cleaning fee—from records of a large group of typical Super users—is $4.75, which shows a dandy profit regardless of the profitable other business that follows.

Why You Do Better With a Super

IT takes so little to operate a Super. "No cost for up-keep to date. May have to buy another hose next season," writes one typical owner who has used his Super 5 years. Countless similar cases make ample proof that the Super is the strongest, most complete, most economical unit because it is designed, built and equipped to properly clean heating plants.

Our book "A Plan to Increase the Business of Dealers in Heating Plants" has pointed the path to bigger profits for men in your business all over this country. It is a complete, practical guide to the proper methods to solicit and handle cleaning business, by explaining simply how others do make more money. It has started many on the road to a bigger success. Ask for your copy, free.

The long record behind the Super is so firmly established that we have no hesitation in shipping you a Super for free trial in your own hands. All risks on us. Anybody can operate it. Standard specialized tools—no extras to buy—not priced high.

USE THIS COUPON

The National Super Service Company
1944 N. 13th Street, Toledo, Ohio

Send me the Plan Book and complete information about your free trial plan and the new low-priced Super.

Name .....

Address .....

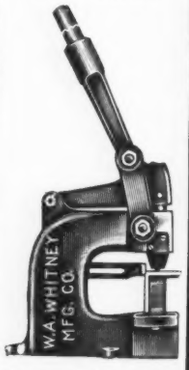
City & State.....

WHITNEY LEVER PUNCHES

No. 4B PUNCH

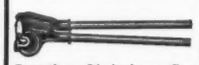
Length—8½ inches. Capacity ¼-inch through 16 gauge. Deep Throat—2 inches. Weight—3 pounds. Punches and Dies — ⅛" to ⅝" by 64ths.

No. 91 PUNCH



Capacity — ⅝-inch hole through ¼-inch, 1-inch hole through ⅜-inch and 2-inch hole through ⅛-inch iron. Depth throat 5-inches. Weight—82 lbs.

No. 1 PUNCH



Length — 34 inches. Capacity — ⅝-inch hole through ¼ - inch iron. Punches and dies in sizes from ⅛ to ⅝ by 64ths.

No. 2 PUNCH

Length — 23 inches. Capacity — ⅜-inch hole through ¼ - inch iron. Punches and dies in sizes ⅜-inch to ½-inch by 64ths.

No. 6 PUNCH

Length — 26½ inches. Capacity — ¼-inch hole through ⅜ - inch iron; especially adapted for button punching or templet work. Punches and dies ⅛" to ⅝" by 32nds.

We have tools for every purpose needed by Sheet Metal Contractors.

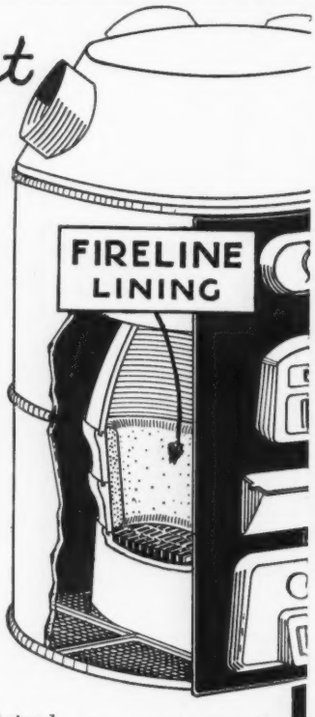
Ask your Jobber

CHANNEL IRON PUNCH

Companion to No. 2 Punch. Every part of the two Punches Interchangeable, including punches and dies. Capacity — ¼-inch hole through ¼-inch iron.

W. A. WHITNEY MFG. CO.
636 RACE ST. ROCKFORD, ILL.

"Burn-out proof"



You can make *any* furnace burn out proof even though at the same time you increase its heat producing capacity. You can step up combustion temperature—eliminate smoke and soot, reduce "ashes" to ashes, can cut fuel bills as much as 20%—you can do this for most of your customers for $15 of which over *$10 is profits for you.* You can do this in an hour's time with Fireline.

Fireline is a new refractory material that comes in air-tite drums. Plastic, it is easily molded completely around firepot walls (to any desired thickness). It sets with any ordinary fire into a 1-piece "firebrick"; protects castings indefinitely. Fireline is guaranteed to withstand 3000 F., not to crack, fuse or spall, to withstand poking and shaking. *It will make even badly cracked or burned out firepots gastite.*

You can keep busy the year around installing Fireline.

FREE SAMPLE

FIRELINE STOVE & LINING CO.
1866C KINGSBURY ST., CHICAGO, U. S. A.

With the Manufacturers . .

California Concern Builds Factory

The Grayson Heat Control, Ltd., 3000 Imperial Highway, Lynwood, Cal., is erecting a factory at 2983 Beechwood.

◆

ARMCO Contracts for New Research Building

The American Rolling Mill Co., Middletown, Ohio, has just awarded contracts for a new research building—new in industrial architecture and building materials—to replace the one leveled by an explosion in December, 1935.

The exterior will be of stainless steel, colorful porcelain enamels on iron, and glass brick. It will be a single story building, designed and to be erected by The Austin Company, and will cost approximately $260,000, exclusive of equipment.

This building, according to Charles R. Hook, president of The American Rolling Mill Company, will demonstrate the full force which low-priced sheet and strip steel can exert in reviving construction activities.

◆

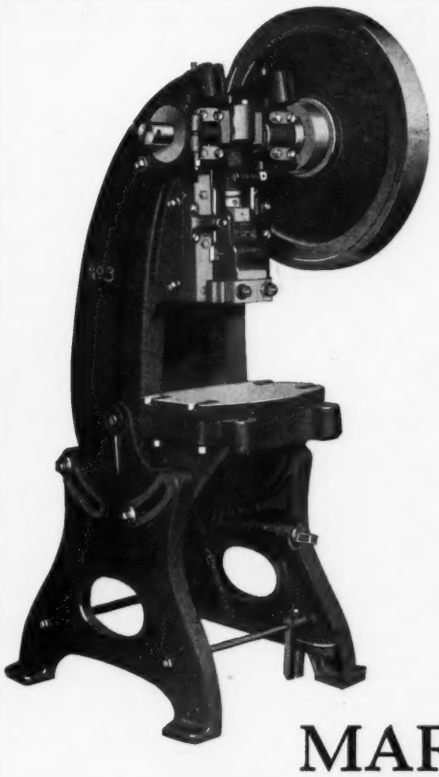
Fox Fabricating Their Furnaces

At the Elyria, Ohio, headquarters of The Fox Furnace Company, a new manufacturing plant which fabricates steel heating elements for furnaces and air conditioning units has been operating during the past few months.

All fabricating of the Sunbeam Series 500 and 8000 gravity steel furnaces, boiler plate heating elements for Series 80, 100 and 700 air-conditioning units and for the new

Series M gas-fired air-conditioning unit just announced, is done under one roof; from squaring the steel sheets delivered by the mill to welding the seams after the parts have been assembled and riveted. Modern and up-to-date machinery has been installed, some of it specially designed by the Fox organization.

According to Fox Furnace officials, their organization, like practically all furnace manufacturers, has been severely taxed to supply the demand for furnaces and air-conditioning units this winter and the facilities of the new fabricating plant will be an important factor in making prompt deliveries.



THE MARSHALLTOWN OPEN BACK INCLINABLE PRESSES

represent the best details of design and construction.

This ruggedly constructed press is arranged with proper distribution of weight giving maximum strength and affording ample die space.

Cut your operating cost and increase your output with a Marshalltown Press.

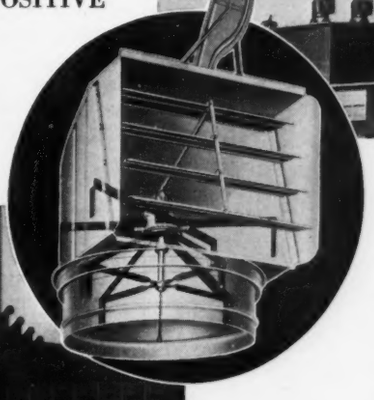
Write us for information you require.

PRESS DIVISION OF THE

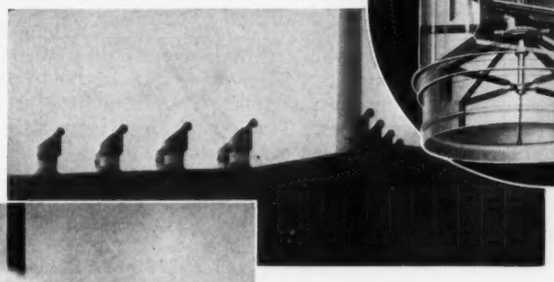
MARSHALLTOWN MANUFACTURING COMPANY

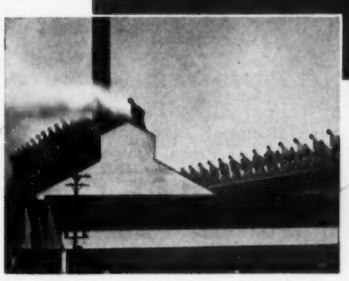
MARSHALLTOWN IOWA

Satisfied Customers Assure FUTURE BUSINESS for You-



Ventilation requirements of today are highly exacting. Health and efficiency of workmen and other building occupants demand POSITIVE ventilation—DEPENDABLE under all weather and temperature conditions. The amount of air moved should be a *known* factor—backed up by years of proven efficiency.





Can the ventilators you offer your customers definitely meet these requirements?

Swartwout Rotary Ventilators CAN and DO. Their 25 year record of satisfactory performance speaks for itself. They require little "selling" and will build up *your* goodwill and profits too.

Why not take advantage of their enviable reputation by recommending and installing Swartwout Rotaries this year?

Prices and data on request

THE SWARTWOUT COMPANY
18615 Euclid Ave., Cleveland, Ohio

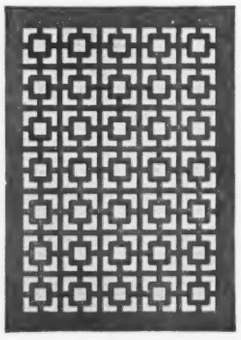
ROTARY BRONZE BALL BEARING
Swartwout Ventilators
MORE ACTUAL VENTILATION PER DOLLAR INVESTED

PERFORATED METALS

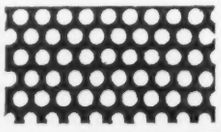
Many designs of Perforated Metal for Architectural Grilles, Radiator Enclosures, Air Conditioners, Cabinets, Safety Guards, and for all screening and sizing operations.

Steel, Stainless Steel, Brass, Bronze, Copper, Monel, Aluminum, Zinc and other metals or materials perforated to your order.

Round holes from .020" to 7". Slot holes from .008" to 3" wide. Square holes of standard sizes. Complete line of brass and tin in small sizes. Prompt Service—Pleasing Prices.



Send us your next specifications.

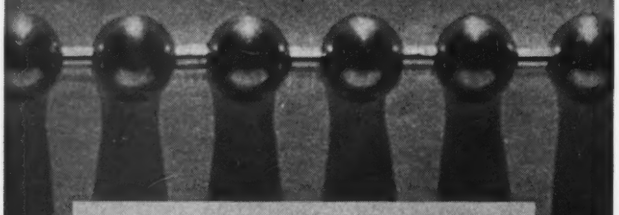


(Note: Equally spaced holes make for uniform strength. Improved appearance and durability.)

The Harrington & King PERFORATING CO.

5649 Fillmore St., Chicago, Ill. New York Office, 114 Liberty St.

For REGULATORS and CONTROLS



BEAD CHAIN*

This smooth running, non-kinkable chain of swiveled metal beads improves both the appearance and operation of ventilator, sky-light, heat control and other regulators. From your jobber, in standard sizes, metals and finishes. Can we help you solve a problem?

COUPLINGS

Cord Connectors and Pendants for many uses, in standard sizes and finishes.

THE BEAD CHAIN MANUFACTURING CO.

*TRADE MARK REG. U.S. PAT. OFF.

BRIDGEPORT, CONN.

News Items . . . . . .

McTigue Active

John T. McTigue and Sons, 415 Commerce St., Nashville, Tenn., has a large roofing trade. It is doing considerable work in Hylite paint on brick, stone, metal signs and walls and shows a window display. The company did the metal work this season on two theatres in Nashville and two others in Murfreesboro and Clarksville, Tenn.

◆

Herbert Adds Sheet Metal Department

T. L. Herbert and Sons, Third Ave. North near Church St., Nashville, Tenn., has added a sheet metal department, with shop near Tennessee Central depot. An up-town show room in its several departments of building materials is shown on Third Avenue North where the office is located. The company has received several local awards.

◆

Activity in Louisville

Gatewood, Sengel Copper and Brass Works, 632-34 Baxter Ave., Louisville, Kentucky, report a very active summer and autumn season. The company recently completed considerable copper work on the Tom Moore Distillery at Bardstown, Kentucky. Also on the Tom Bixler Distillery, at Jupiter Springs, Kentucky.

◆

Brisk Activities in Memphis

Pidgeon-Thomas Iron Co., South Main and Iowa St., Memphis, Tenn., one of the oldest iron, steel and building supply firms in Memphis, devotes a considerable department to crimp roofing, fencing, gin supplies and paints.

◆

Redecorates Metal Show Room

H. O. Parmer, Fifth Avenue. North near Crawford St., Nashville, Tenn., is improving their metal show room and plant with a coating of white paint. It is a large and finely arranged plant. The firm has been active since 1889. Roy Parmer, present head, succeeded his father and grandfather.

◆

Repair Work Active

E. T. Murray and Co., 144 Third Ave. North, Nashville, Tenn., is one of the oldest and largest sheet metal firms in Nashville. It has been active since 1874. A son of the founder, who died about eleven years ago, now heads the business. The Murrays have had years of practical experience and the shop is a very complete one, with many sky-lights in the work room and much machine equipment.

◆

Activity Reported in Little Rock

J. T. Hornibrook Co., 209 East Markham St., Little Rock, Ark., is busy with numerous sheet metal and ventilation contracts. They have one of the well equipped shops in up-town section. They also have some furnace work in progress. The several sheet metal firms in Little Rock have enjoyed a very good season in blow pipe work, as Arkansas abounds in cotton gins, cottonseed oil mills, and also in lumber and cooperage plants.

◆

Large Tennessee Shop

R. A. Johnsonius, North Poplar St., Paris, Tenn., conducts one of the largest sheet metal shops in the section. He follows in the footsteps of his father, who came from Holland many years ago and who until his death was a prominent sheet metal worker, with the exception of the time he served in the Tennessee General Assembly. The Johnsonius shop of 1936 also devotes attention to furnaces and warm air conditioning.

"BB"

The mark of quality on sheet metal and roofers' supplies

BERGER BROTHERS CO.

229-237 ARCH STREET, PHILADELPHIA, PA.

EAVES TROUGH
GUTTER HANGERS
CONDUCTOR PIPE
CONDUCTOR FASTENERS
MITRES
END PIECES AND CAPS
CONDUCTOR HEADS
ORNAMENTAL STRAPS
VENTILATORS, ETC.

FOURSQUARE SHARP DETAIL

Canton Line

MODERN STEEL CEILINGS

Your finished job will depend largely upon the clean, sharp detail and FOURSQUARE accuracy of your ceiling plates. All Canton Line ceiling plates are resquared, assuring precision throughout every lineal foot. Our modern designs will help you get more volume. Write for complete information.

CANTON STEEL CEILING CO.
CANTON, OHIO

PREMIER
FURNACE CLEANERS

ONE HORSE POWER MODELS $79.50 and $84.00
HALF HORSE POWER MODELS $55.00 and $59.50
COMPLETELY EQUIPPED

Premier Furnace Cleaners are powerful and light weight, yet sturdily built to stand years of rugged service. Weighing less than 50 pounds, they are one-man cleaners and have been the furnace man's favorite for years. Premier Cleaners are ideal for upstairs use and may be used independently from the container for suction and blowing use in cleaning air ducts, registers, grills, radiators and air conditioning equipment.

Motor specifications for these powerful cleaners are:
1 H.P. maximum vacuum 46 inches in water.
½ H.P. maximum vacuum 31 inches in water.

Business-Getting, Return Post Cards are Available for Dealers at Low Cost

Buy It From Your Local Jobber or Write the Manufacturer

Furnace Cleaning Instruction Booklet Free with Each Cleaner

ELECTRIC VACUUM CLEANER CO., INC.
1734 Ivanhoe Road • Cleveland, Ohio

★ NuDRY ★
FURNACE CEMENT

Here's the perfect all season furnace cement. A cement that will earn you many a profitable job with its superior performance and lasting qualities. It has features you've always looked for . . . just check them over and see for yourself . . .

★ It comes to you in dry form.
★ Takes less material to set a furnace.
★ Does not crack or powder when furnace is fired immediately after applied.
★ Will not shrink—keeps joints tight—stands high temperature—is not affected by temperature changes.
★ No loss because it will not harden in containers—will not freeze in winter.
★ Requires only 5½ lbs. where you ordinarily ship 10 lbs.—It saves freight.

. . . and we'll prove it further! You just fill out the coupon below giving us your jobber's name and address, and we'll send you FREE—a 5½ lb. sample of NuDRY. Don't delay—fill out the coupon now and mail it in.

PYROLITE PRODUCTS CO.
1221-31 W. 74th St., Cleveland, Ohio

Name .....
Address .....
Jobber's Name .....
Jobber's Address .....

News Items . . . . . .

Henck of Galveston Dead

Alfred Christian Henck, 54, proprietor of a tin shop at Galveston, Texas, for many years, died Friday, February 12, at his home, 1919½ North.

◆

Wessendorf of Memphis Passes

Funeral took place February 8 for Charles Edward Wessendorf, 82, for many years a prominent man in the heating and sheet metal business in Memphis, Tennessee, operating for sixty years a large establishment now located at 195 Washington Avenue.

◆

Galyon of Knoxville Advertises

Galyon and Co., 414 N. Gay St., Knoxville, Tenn., distributors for Amalgamated roofing started a promotional campaign in estimating and roofing suggestions for their patrons in January.

◆

A-C Home Study Course

Rutgers University, New Brunswick, New Jersey, through its Extension Division, announces the complete revision and enlargement of the home study course in air conditioning.

Lavish use of new tables, drawings, and also cuts and figures of typical devices provided by a large number of purveyors of equipment brings the new course to to date with current practice. The university states that although the revised air conditioning course will be found of particular value to the technical graduate desiring a better understanding of this new field, it is by no means too difficult for the technically-minded student of fair preparation.

An outline of the course may be secured by writing to C. G. Gaum, Professor in University Extension at the University.

New L. A. Sheet Metal Shop

The Contractors Sheet Metal Works has been established at 2604 S. Harcourt avenue, Los Angeles, Cal., by Alfred C. Chapman and Edward S. Robinson.

◆

Frank Czadek in Spooner, Wisconsin

Frank Czadek, in business in Woodstock, Illinois, some five years ago, has again entered the warm air heating and general sheet metal business at Spooner, Wisconsin, where he would be pleased to hear from old friends who formerly called on him in Woodstock.

Mr. Czadek's present plans are to continue the operation of his fishing lodge known as Dun Rorin, located on Lake Chippewa at Hayward, Wisconsin, and to build up the Czadek Sheet Metal Works at Spooner.

◆

Air Conditioning Course

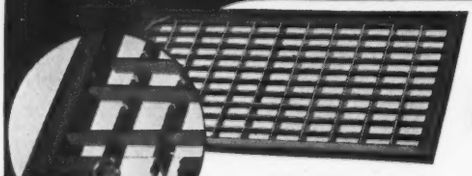
Air conditioning will be the subject of a general course in the Extension division of the Columbia University School of Architecture during the Spring Session. R. W. Waterfill of Buensod-Stacey Air Conditioning, Inc., will direct the work, which is designed to present fundamental principles of air conditioning and air conditioning systems, as well as the relation and functioning of the various units of a system.

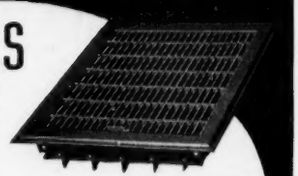
The physical and thermal properties of air and water mixtures and their physiological effect, air movement and heat transfer, particularly through building walls, will be considered as well as the theory of refrigeration systems and refrigerants, auxiliary equipment, controls, load analyses and costs. History, evolution, terminology, and codes will be discussed.

Effort will be made to present the material to both the technically and non-technically trained student. Practical usage of the psychrometric chart and the handling of heat and air will be emphasized. The class will meet on Monday and Thursday evenings at 8:25 o'clock.

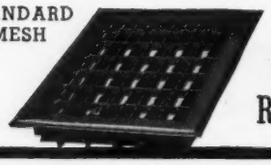
INDEPENDENT "Fabrikated" REG U.S. PAT. OFF.

FLOOR REGISTERS & COLD AIR FACES





STANDARD MESH



AND CLOSE MESH

AIR CONDITIONING REGISTERS & GRILLES

SEND FOR CATALOGS

THE INDEPENDENT REGISTER CO.
3741 E. 93rd ST., CLEVELAND, OHIO

A GRAND RAPIDS FURNACE CLEANER
will start your Spring business.

Our manual, "A Plan To Increase Your Sales" goes with the machine. It outlines every detail in building your business through furnace cleaning. This is not an armchair theory but the outcome of successful experience. It will work with your business set-up. Refined and Improved.

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Unbelievably Low Priced.
Write for details
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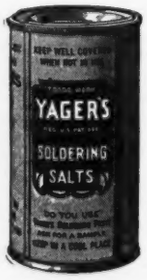
Grand Rapids, Michigan



YAGER'S
Soldering Salts
FOR ALL SHEET METAL SOLDERING

Packed in ½ lb., 1 lb., 5 lb., 25 lb. and 50 lb. cans
AT YOUR JOBBER OR WRITE US
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APEX LOCK-TITE

Damper Regulator Set

C-4

Consists of 1 1/4" C Regulator, 1 pair No. 4 Bearings with Rivets and Metal Screws. Packed 12 complete sets in a box.

Apex Damper Regulators are all steel and cadmium coated.

Their self-sealing features stop all waste of heat and air.

The wing nut locks the damper in any position and indicates the position of the damper in the duct.

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CIRCANE

Circane was designed to meet the requirements of simple dignity, normal concealment and major free air space opening. It is a development of the age-old combination of the circle and cross peculiar to several ancient civilizations. It is particularly suitable for early American or Georgian period requirements. Made in Bronze, Brass, Aluminum and Cold Rolled Steel. This folder shows CIRCANE and other new WISSCO designs. Send for a copy.

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41 East 42nd St., New York City
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"THE TOOLS YOU NEED TODAY"

25 YEARS EXPERIENCE BUILDING QUALITY PRODUCTS

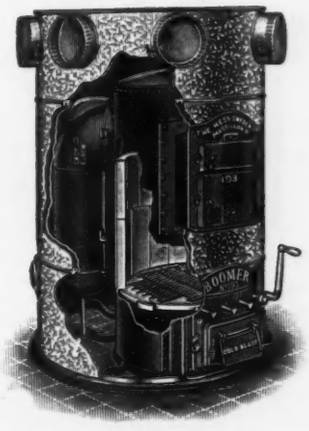
OVER 80 ITEMS FROM WHICH TO CHOOSE

Light
BENDING BRAKE
"AIR CONDITIONING SPECIAL"

●The ORIGINAL Portable Bending Brake. Weighs only 265 lbs. (bench type). Full 49 in. capacity in 20 ga. metal. Built throughout for accuracy and durability. Has special Whitney features originally developed for larger and heavier brakes. Box and pan model (with detachable fingers) also available. Now in use by many leading sheet metal shops. Write for full information, or see your Whitney dealer.

WHITNEY METAL TOOL CO.

91 FORBES ST., ROCKFORD, ILL.



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Also made with duplex grates and upright shaker.

Have been successfully made for 23 years. Where introduced have given satisfactory service. The fire pot liners are the best we can buy and we know of several Boomers that still have the original liners in, which are 23 years old. We have been making cast iron Boomers for 50 years.

If you are interested in selling a strictly high grade furnace, ask for prices and agency.

Nothing but the best of material enters into the making of Boomers.

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We sell to legitimate dealers only.

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Massillon, Ohio

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SHEET METAL WORKING
MACHINERY

If it is a machine, tool or supply for the Sheet Metal Shop—We have it!
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Your inquiries earnestly solicited.
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WITH
The TORNADO Furnace Cleaner

The TORNADO gets you into the basement where it is easy to sell repairs and new furnaces. And you make a profit on the cleaning job too!

The TORNADO is the most powerful furnace cleaner built. Leads the field! Low price—easy payments—free trial. Approved by Anthracite Institute and Underwriters Lab. Thousands in use. Write now for complete information.

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EQUALS
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Every pound of pressure on the handle of a Viking produces 20 pounds at the blade. Viking's original compound lever arrangement does it. Choose a Viking for its strength, long life, easy handling and low cost.

The cutting blade, ¼" thick, made of specially tempered high grade tool steel, keeps its edge for a remarkably long time and is easily replaceable. Write for complete details—buy from your jobber.

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A.G. BRAUER SUPPLY CO.
316 N. THIRD ST.
ST. LOUIS, MO.

New Literature . . . .

For your convenience in obtaining copies of new Literature, use the coupon on page 116.

119—Copper Roofs in the Making

Revere Copper and Brass Incorporated, 230 Park Avenue, New York City, is distributing No. 5 of "Revere Minute Man." "Copper Roofs in the Making" is one of the interesting stories in this issue.

◆

120—Lessons in Arc Welding

The Lincoln Electric Company, 12818 Coit Road, Cleveland, Ohio, is offering mimeographed lessons in arc welding at low cost. These lessons (44 of them) are bound in looseleaf form.

◆

121—Accessories Catalog

Robert Barclay, Inc., 122 North Peoria St., Chicago, is distributing Catalog No. 102—Winter, 1937—all accessories for oil burners, stokers, forced air heating.

◆

122—Hobart Electric Arc Welding

Hobart Brothers Company, Box FR-173, Troy, Ohio, is distributing an attractive new catalog on their new 40-volt Simplified Electric Arc Welding. The catalog contains many illustrations of the various jobs this new welder can handle, as well as the complete description of the line, specifications, etc.

◆

123—Technical Definitions

Grant Wilson, Inc., 4101 West Taylor Street, Chicago, is distributing a sheet of common technical definitions as applied to the heating and air conditioning field—conductivity, factor, convection, black body, resistivity factor, reflectivity, radiation, absorptivity, conduction, emissivity, transmittance and dew point.

◆

124—How to Make a Financial Statement

The American Rolling Mill Co., Middletown, Ohio, is distributing the January, 1937, issue of "Ingot Iron Shop News." In this issue the company makes an offer of copies of a free article entitled "How to Make and Analyze a Financial Statement." This article tells in simple language how to make up a profit and loss statement; a balance sheet; how to figure assets and liabilities; what should be included in overhead; and many other valuable discussions that will enable a business man to get a clear financial picture of his business. These articles are available through the development department and asks the name of the distributor who supplies the inquirer's sheet metal needs.

◆

125—Stainless Steel and Architecture

United States Steel Corporation subsidiaries, 71 Broadway, New York City, is distributing a 16-page catalog entitled "Stainless Steels in Architecture," with facts, photographs and drawings specially prepared for the architect and his fabricator.

Stainless steel (18-8), they say, is the only commercial metal whose surface, like glass, is permanently impervious to weather.

The term "stainless steel," identifies a group of alloys of iron, chromium and usually nickel, together with small amounts of other elements. These alloys are characterized by an amazingly high tensile strength combined with excellent resistance both to corrosion and to heat. USS 18-8 is said to effectively resist all the destructive forces of nature—stress, corrosion, heat, wear and time itself.

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LONG LIFE

This remarkable alloy prepared under an exclusive Lyon, Conklin & Co., Inc. formula outlasts by years ordinary sheet metals. To get the most for your sheet metal dollar--insist upon Lyonore Metal for all sheet metal work. Complete details upon request.

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Baltimore, Maryland

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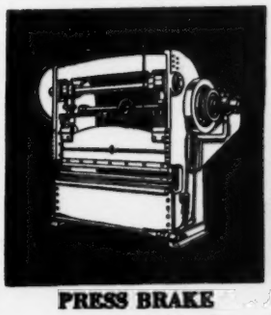
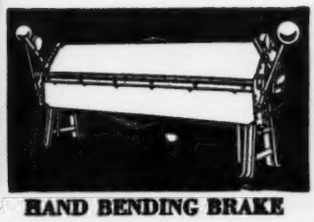
CHROMIUM • NICKEL • COPPER • IRON ALLOY



CHICAGO



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Steel Brakes—Presses—Shears

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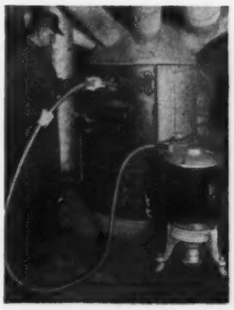

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SAVE $$$$$ with a KENT Double Suction

What if the initial cost of a KENT is slightly higher—there are three ways to more than save it!

Spend LESS time doing the job! FEWER lay-ups for repairs! MUCH *longer* machine life!

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ACME "Hot Spot" WELDERS

Universally accepted as the sturdiest, easiest handled, most economical electric Spot Welder on the market.

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Don't Rivet SPOTWELD! with an ACME
Lifetime Guarantee!

Complete range of sizes

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Warehouses in principal cities
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Victor heating equipment is a line that enables you to buy all your requirements from one reliable source.

This Victor demonstrator enables Victor dealers to close sales at a profit. Investigate this money making line. Write or wire.

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ALL-ALLOY No. 2 cuts up to ¼" steel plate.
ALL-ALLOY No. 1 cuts up to No. 11 gauge strip or sheet.
Special blades may be had for shearing stainless steel.

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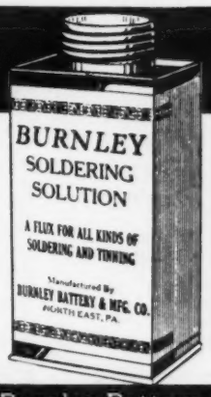

BURNLEY TRADE MARK

Just a reminder to help you make sure of getting the Soldering Flux your Dad used. Skilled hands reach for Burnley because "it never lets them down." Show us a Sheet Metal Worker who has never used Burnley Soldering Salts or Paste—he gets a generous free sample by return mail. Ask your jobber for Burnley — he carries it—"If he knows his fluxes."

Burnley Battery & Mfg. Co • North East, Pa.
Soldering Paste, Salts, Solution, Stick

New Literature . . . .

For your convenience in obtaining copies of new Literature, use the coupon on page 116.

126—Prize Contest

The James F. Lincoln Arc Welding Foundation, P. O. Box 5728, Cleveland, is distributing a small envelope stuffer inviting contestants to write for the book of rules and conditions governing the contest recently announced. 446 prizes totaling $200,000 are provided for the best papers in 44 industry sub-classifications.

◆

127—High Temperature Insulation

Armstrong Cork Products Co., Lancaster, Pa., is distributing five new booklets—"High Temperature Insulation for all types of Heated Equipment," "How to Lessen Vibration with Armstrong's Vibracork," "Armstrong's Corkboard Insulation for Walls and Roofs," "Armstrong's Cork Covering for All Cold Lines," and "Specifications for Installing Armstrong's Cork Covering."

◆

128—Kenmar Copper Shingles

The New Haven Copper Company of Seymour, Conn., is distributing a pocket folder of literature and four samples of Kenmar Copper Shingles, a patented principle. Heavily corrugated lines run the length of these singles and the makers state these corrugations take up the expansion and contraction of the shingle, thus insuring that they will always stay tightly nailed down to the roof. They are fireproof, and when properly grounded are said to afford an ideal protection against lightning. A transverse stiffening corrugation or roll gives a thick butted effect which throws beautiful shadow lines and serves as a snow guard in winter.

129—Trade Discount Sheet

United States Register Company, Battle Creek, Michigan, is distributing a trade discount sheet effective January 1, and applying to new list prices on floor registers, faces, etc., which will appear in new list price sheets.

◆

130—Stainless Steels in Architecture

Carnegie-Illinois Steel Corporation, Carnegie Building, Pittsburgh, Pa., has just published a 16-page booklet entitled "Stainless Steels in Architecture," with facts, photographs and drawings specially prepared for the architect and his fabricator.

Stainless steel (18-8) is immune to atmospheric corrosion, has tensile strengths several times greater than mild steel, effective heat resistance up to 1600-2100 deg. F, and has a variety of finishes ranging from a high polish to glowing satin.

FOR YOUR CONVENIENCE

American Artisan, 6 N. Michigan Ave., Chicago, Ill.

Please ask the manufacturer to send me more information about the equipment mentioned under the following reference numbers in "New Products" and "New Literature." (Circle numbers in which you are interested):

22	23	24	25	26	27	28
29	30	31	32	33	34	35
36	37	38				
109	110	111	112	113	114	115
116	117	118	119	120	121	122
123	124	125	126	127	128	129
130						

Name..... Title.....

Company .....

Address .....

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Tuller Hotel

DETROIT MICHIGAN

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You'll get more for your money at Pick Hotels. Spacious, comfortable rooms. Delicious food and real personal service. All at moderate prices.

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DETROIT, MICH. ..... TULLER HOTEL
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CANTON, OHIO ..... BELDEN HOTEL
INDIANAPOLIS, INDIANA ..... ANTLERS HOTEL
ANDERSON, INDIANA ..... ANDERSON HOTEL
TERRE HAUTE, INDIANA . TERRE HAUTE HOUSE
ASHLAND, KENTUCKY ..... VENTURA HOTEL
OWENSBORO, KENTUCKY . OWENSBORO HOTEL
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PICK HOTELS

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Why Pay More?

—for first class hotel accommodations, when you can enjoy the fine hospitality, convenient location and excellent service of Hotel Lenox at these moderate rates—

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Special for 2 Rooms and Bath 3 persons...$5.00; 4 persons...$6.00

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BUFFALO, N. Y.

Coming to ——

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Room with Bath from $2.50 up

HOTEL PHILADELPHIAN

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39TH and CHESTNUT STS.

PHILADELPHIA, PA.

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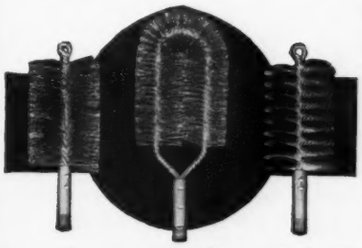
XX TH CENTURY HEATING & VENTILATING CO.
AKRON, OHIO



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BUY SCHAEFER-IT'S SAFER

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SITUATIONS WANTED

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MISCELLANEOUS

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Barrister Bldg., Washington, D.C.

RIBBED WIRE GLASS-15c per SQ. FT.
STOCK SHEETS, CASE LOTS, PLUS BOXING F. O. B. BUFFALO, N. Y. SHIPMENT TO ANY PART OF THE UNITED STATES
QUOTATIONS ON ALL KINDS OF GLASS ON REQUEST
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Large Manufacturer of Sheet Steel Building Products requires the services of several experienced salesmen to sell Roofing, Spouting, Sheets, Ceilings, etc. Territory east of Chicago. In applying advise age, nationality, experience, territory covered. Our own organization knows about this advertisement. All replies held strictly confidential. Address Key 391, "American Artisan," 6 No. Michigan Ave., Chicago.

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Used Chicago elbow machine wanted. Give lowest price and complete information in first letter. Address Key 394, "American Artisan," 6 No. Michigan Ave., Chicago.

Use AMERICAN ARTISAN Classified Advertising for quick results. It puts you in direct touch with the buyers and sellers in the warm air heating, sheet metal contracting and air conditioning industry.

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Sheet Metal Machines
New and *Really Rebuilt*

A machine for every use and every machine is ready for use. The largest stock in Chicago. Ask for list.

Complete supplies and tools.

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MANUFACTURERS WANTING ADditional representation often come to us for names of prospective agents now handling other lines in this field on a commission basis in a definite territory. It will pay you to be on record with us so we can refer your name to interested manufacturers. No charge or obligation, of course. It is a service we render free to manufacturers and representative. Just drop a line that you are interested in being on file and we will send you form to fill out. Address American Artisan, 6 N. Michigan Ave., Chicago, Ill.

JOHNSON'S
NEW HANDY MANUAL
on
HEATING, VENTILATING
MECHANICAL REFRIGERATION
and
AIR CONDITIONING

432 pages of practical, condensed information, tables, rules and diagrams. Price $1.00 — Remit with order to

KEENEY PUBLISHING COMPANY
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FOR SALE

BRAND NEW 10KVA SPOT WELDER

$10.00 extra for water cooled electrodes.

18" arms—capacity 2 pieces 14 gauge and lighter. ONLY $150.00.

Here is a real opportunity to buy a New Spot Welder at a used price.

Immediate stock shipment. Subject to prior sale. Write at once for descriptive circular.

"Draw on the Most Complete Stock in America"
INTERSTATE Machinery Co., Inc.
130 S. Clinton St., Chicago
(Free Parking)

Thrills of Advancement Are Within Your Reach!

Sheet Metal Men to be Successful must fully understand Pattern Drafting, Plan Reading, Estimating, Designing, Calculations, Air Conditioning, etc. Your spare time at Home will achieve wonders for next Spring and Summer. Come! Study for Advancement Now. Our Courses are specially prepared for Home Study.

Full information is free—no obligation—select your Course, and write today.

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☐ Forced W-A Heating and Air Conditioning.
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4541 Clayton Ave. St. Louis, Mo.

FOR SALE: Fully equipped Sheet Metal Shop in Western town, doing good business. Owner wishes to retire. Terms and conditions can be arranged. Address A. DeLucchi, 225 E. Fourth St., Reno, Nevada.

FOR SALE: Used vacuum furnace cleaners in good condition at reasonable prices.
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Box 906, Holland, Michigan
Makers of the World's Largest Electric Power Suction Cleaner

Sheet Metal, furnace, air conditioning, roofing, and radiator business. Established eighteen years. Enough work for two men steady. Best nine thousand railroad division and shops in state of Colorado. Too much responsbility for owner. Will sell or lease. Address Key 393, "American Artisan," 6 No. Michigan Ave., Chicago.

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Waterloo Register Co., The.... *
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Wickwire Spencer Steel Co.....113
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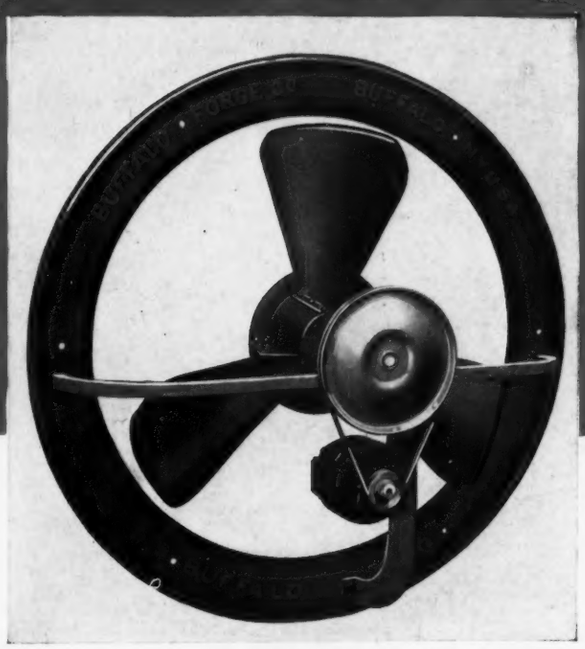
XXth Century Heating & Ventilating Co. 117

Young Radiator Co..... 89
Youngstown Sheet & Tube Co.. 15

When SUMMER Comes . .

WILL YOU be far behind in home cooling PROFITS?



No Sir!—Not if you can qualify as a Breez-Air Distributor or Dealer! "Breez-Air" Fans for Attic cooling are an excellent proposition for organizations set-up for house-to-house selling. They are easy to install, efficient, very QUIET. They are competitively priced.

Good Territory Still Open

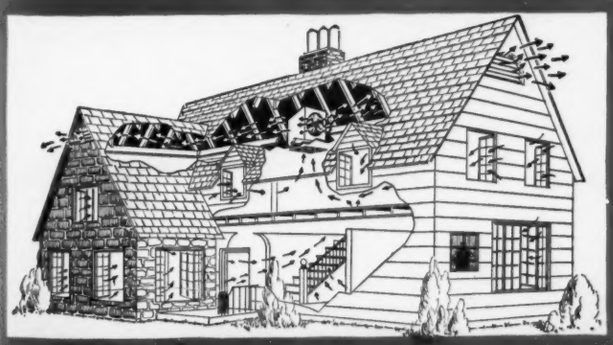
Considerable territory is available for distributors who can carry a stock and for dealers with suitable selling organizations. Write or wire for details.

BUFFALO FORGE COMPANY

497 BROADWAY BUFFALO, N. Y.

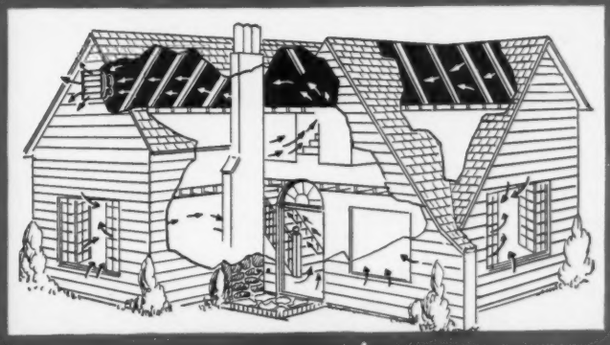
Branch Engineering Offices in Principal Cities

In Canada: Canadian Blower & Forge Co., Ltd., Kitchener, Ont.



Breez - Air mounted in attic side wall with ventilating louvres.

Breez-Air Fan mounted in box which stands on attic floor.



VALUE— *what is it?*

When you buy metal sheets, heating equipment, roofing, in fact, anything—you're looking for value. Everyone is. But what, after all, is value and where are you most apt to find it?

Webster defines value as "the properties of a thing which render it useful—worth, excellence." You will not usually find such worth in the products of little-known manufacturers, in seconds or in so-called bargains. But, it must be present in any article which has stood the test of time.

Osborn's reputation for quality is not based on price. It is based on our own good name and that of the dozens of manufacturers whose products we have handled for many years. It is based on value—a usefulness and excellence of materials on which you can always count, regardless of price.

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Metals and Metal Products

A DEPENDABLE SOURCE OF SUPPLY FOR 79 YEARS